CHEMICAL & METALLURGICAL ENGINEERING

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CHEMICAL & METALLURGICAL ENGINEERING

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H. C. PARMELEE, Editor

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The New Tariff
Law of the Land

REVISING the tariff has been such a slow and disgusting process that most of us are glad it is over and that the Fordney-McCumber act has at last found its place on the statute books. The uncertainties that for twenty months have attended the maneuvering of the politicians and lobbyists have had a most depressing influence on business and, to a lesser extent, will continue to have until the courts have given final interpretation to the involved construction of many of the new tariff schedules. As for the law itself there is but little good to be said about it. Probably it is too early to pass judgment on its effect on industry, but after a brief study of its make-up we would hesitate to predict for it the quality of permanency which in the early stages of its preparation was supposed to be its distinguishing characteristic.

If there is any single feature in the new law, however, that marks an advance in tariff legislation, it is the provision for flexible administration. When Congress surrendered to the President the authority to raise or lower duties in order to meet changing conditions of competition, the first step was taken toward divorcing the tariff from politics. That beginning carried to its logical conclusion may some day mean a tariff controlled and administered by an impartial, non-political agency.

The dye and chemical provisions are no more satisfactory to our industries than is the law itself. It would seem that the dye embargo is a dead issue. On different occasions the Ways and Means Committee, the Finance Committee and the joint conference have each succeeded in inserting the embargo feature in the bill only to see it rejected subsequently by a majority vote of the Senate or House. Its last appearance in the original report of the conferees was something of a surprise to the industry, but is now generally regarded as a clever political move on the part of one of the embargo's most bitter opponents. The net effect as far as the industry is concerned is a much lower duty than had been approved by the Senate under the Bursum amendment.

But the sorest loss of all arises from the fact that the provision for synthetic organic chemicals other than from coal tar somehow got lost in the shuffle and emerged from the conference with a paltry 25 per cent ad valorem—and on foreign valuation at that. This strikes at the very root of our fine chemical industry and efforts are already under way to remedy the situation. It is our sincere hope that they will be successful, but from experience and some little knowledge of the workings of that inexorable body in Washington, we can scarcely regard the outlook as promising. For our own part we are inclined to believe that the chemical industry should make the best of a sorry situation. We should forget about the tariff and get down to work building an industry on that solid foundation of research and technology which will not be swept away by the changing tides of politics.

The Chemical Industry
And Its Exposition

WORSE than the confusion of tongues at Babel is the diversity of criticism current for the past two weeks regarding the Chemical Exposition and its management. Most of the talk is beside the point because it deals with numerous non-essentials that are a by-product of any controversy.

The elements of the situation are these: We have an exposition managed by a company that is in that business. The show is conducted for profit. Naturally there has been some dissatisfaction with the service rendered to exhibitors. It seems inevitable. The essence of the criticism is that the exposition management makes too great a profit; that it has departed from the ideals of the founders; and that exhibitors have no voice in many features of the show affecting their personal interests. More concretely, dissatisfaction has found expression in the proposal to organize and run another exposition.

Without launching into a long discussion of the whole subject, it can be set down as final that the chemical industry does not want and will not support two expositions. An attempt to put them on will result in disaster for both and perhaps final abandonment of any show. In our judgment the present management, with its experienced organization, offers the most practical means of continuing the exposition as long and as frequently as the industry wants it. If its methods and ideals are not agreeable to some of the exhibitors, an attempt should be made to change them, rather than to launch a new exposition. The management has repeatedly expressed not only its willingness, but its desire, to meet exhibitors' wishes as far as possible.

The crux of the whole matter is the necessity of having but one exposition, and the thing for exhibitors to determine is the most practical means of attaining that end. The expense of exhibiting at one show will be quite as great as at another if both are free to the public; and the advantages of a co-operative show are more imaginary than real, if we may accept the opinion of those who have tried both. Co-operative exhibitors must be prepared to meet deficits as well as to share profits. In short, we are inclined to the view that dissatisfaction over costs and profits will not be diminished by supporting a new exposition on a co-operative basis.

Undoubtedly much of the present criticism would disappear if the exposition management had a closer con-

tact with its exhibitors. This is not impossible of accomplishment and perhaps some way can be found whereby the exhibitors can transmit their views and sentiments to the management, and through occasional conferences come to agreement on moot points. Every reasonable means of attaining this end should be exhausted before resorting to more drastic action.

The Riddle Of Corrosion

PROBABLY more than one philosophic Indian, during the course of the last 1,500 years, has looked with envy on the remarkable iron pillar at Delhi, and wondered how it continued standing through the ages, rustless, while his own iron tools and kettles, made of the same stuff and in the same way, wasted away during his lifetime. Apparently the same, yet somehow different.

That riddle is still unsolved. Science, during the last century, has invented many names to denote many facts and phenomena concerning rusting, but we still wonder why one lot of condenser tubes will stand almost indefinitely under sea water, while another batch from the same reliable maker—indistinguishable except for labels—will be perforated by pitting within a few months. Apparently the same, yet somehow different! The differences may be so obscure as to yet escape detection, or for that matter may even be too minute for observation by our present-day apparatus.

Much careful study has been given the corrosion problem—and not more than it deserves, since it undoubtedly costs the world billions of dollars annually to protect its metal and replace that which was not protected in time. Innumerable laboratory determinations have been made, measuring the amount of weight lost by a metal when exposed to certain more or less well-controlled circumstances. But the trouble is that the metal does not always waste away uniformly or at a constant rate—localized corrosion and corrosion products are often the most dangerous. Hence, thinking back, it has been agreed that a very important factor is the action of the metal immediately upon immersion; its future history is dependent upon whether the first products of corrosion stick to the metal and protect its foundation.

So far, so good! Given the undoubted fact that a surface film forms, everybody interested in corrosion ought to start studying surface films, and discover what kind of film will stick tightly to the metal and not split off when the temperature changes (or if torn off, will immediately re-form), what kind of a film will be so impervious to its surroundings that it will not continue to grow, nor be continually removed as fast as or faster than it forms. But it's not as easy as it sounds. These films, in the first place, may, and quite often are, perfectly colorless and transparent. A logical deduction from the ideas presented elsewhere in this issue by Dr. SAKLATWALLA is that they are often only a few molecules thick and far below the limits of our most powerful microscopes. Or if we lean toward LANGMUIR'S ideas, the metal is joined to its gaseous surroundings by the same kind of forces that hold chemical compounds together, and has no independent existence.

To study such stuff a new technique is needed. Some new instruments, employing vaguely known or undiscovered physical properties, will be necessary before one can study the nature of such diaphanous garments. Microchemistry and microphysics, of which we know only a smattering, will have to be extended to ultramicro regions before the kind of atoms contained in these protective films and their spatial arrangements can be known.

It will be a safe prediction that many years will elapse before we shall be able to draw a correct space lattice of the surface film on freshly cut aluminum or iron. Even if they are so obviously different in construction as to indicate immediately why the former resists the corrosion of the atmosphere while the latter does not, we shall still have to discover the way to make iron or a simple alloy of iron automatically build up a coating of the desired type.

Empirical trials may hit upon that method before we know much more about the real mechanism of corrosion, just as we have discovered that copper-bearing steel is excellent metal for sheathing. Furthermore, we have given up the search for an absolutely incorrodible metal, or one which will resist equally all reagents, gaseous, liquid and solid. A certain amount of wastage will always occur, but it can be minimized by careful selection of metals based upon an intelligent interpretation of available data. First approximations in this respect can be now made for hitherto untried conditions by remembering that corrosion is a compound action, consisting first of the formation of a reaction product, and second the removal of this product. If the two rates can be determined in the laboratory and the first is more rapid than the second, the metal will have a fair chance to endure.

Wanted—An Immigration Policy

THE PRESENT 3 per cent immigration law, having outlived its usefulness, if it was ever to be commended at all, is destined to be followed by something else. Instead of a makeshift being put on the statute books as another experiment, a definite and intelligent immigration policy should be adopted, and legislation worked out accordingly.

Republics are said to be in the habit of doing things too late. They certainly are slow in recognizing new conditions such as require new policies and new legislation. The disposition is to assume that as we have got along all right so far we can peg along for a few years more.

It should be emphasized that new conditions exist, and the public should be told what changes have occurred. The prevalent view seems to be that the great new condition that exists is the one growing out of the war. That is a change in conditions abroad. We should like to point out that long antedating the war a change occurred in the United States, a very important one and one that must be considered in all its bearings or nothing like a proper immigration policy can be developed.

That change is in the opportunity the country offers the immigrant. We have been an independent country for fourteen decades. For a little more than half the time we offered great opportunities for the pioneer, the man who came here to act of his own initiative, to do something himself. The opening of the West and Northwest after the Civil War offered the last great opportunity of this sort. In the recent decades the chief attraction to the immigrant has been nothing more than a job in the mine or mill or perhaps at coke ovens. Of course in the earlier period some men came over merely to hold a job, and in the later period some have come

over to make a fortune, possibly as a fruit peddler or as a dealer in old clothes. In general, however, the distinction holds good.

That our immigration has not been as satisfactory in recent decades as formerly, from the viewpoint of the general good of the country, is very well recognized. The difference is often mentioned, but usually it is left to be assumed that the difference is chargeable against those who choose between coming to the United States and staying at home. The real difference, however, is due to changes that have occurred in the United States, and that fact should be the starting point for the development of an immigration policy. Realization of the fact will banish the notion that since we used to get along we ought to be able to continue getting along.

The ordinary habits of thought of the individual are not always logical. Conclusions parading as the result of logical thought are frequently the product of emotions. With collective thought or conclusions the divergences are still more common. As a people we should decide upon certain definite premises and then seek the answer. Do we want immigration? For what purpose do we want it? What kind of immigration do we want to meet that purpose? How shall we obtain it? How shall we handle it when it comes?

If we settle these questions step by step, we shall accomplish intelligent results. If we slur them over, we shall have simply a hodgepodge debate in Congress with makeshift legislation calculated to get votes rather than good immigrants.

To illustrate: There are those who do not want any immigration. They should be yielded to or silenced at the outset. They cannot be expected to give wise counsel when we are attempting to decide how we shall obtain immigration.

Black Fractures in Carbon Tool Steels

IN OUR ISSUE for August 9 we published a short article by Mr. GREEN on "Black Fractures in Carbon Tool Steels." Since then many of our friends have been good enough to point out that the occurrence is a simple case of graphitization. Steel makers have apparently seen the structure before—sometimes oftener than they wish—but have said very little about it in print.

On page 650 of the present issue we publish the results of a brief supplementary study of Mr. GREEN'S steel by Messrs. RAWDON and EPSTEIN of the Bureau of Standards. A careful study of the two papers will doubtless reveal the fact that the case is not so simple as it appears.

In the first place, silicon—which all authorities agree is the thing that accelerates graphitization—is uniform and far below the danger point (0.10 per cent) in both light and dark zones. Second, why should there be such a pronounced and regular outline to the graphitized areas (suggesting the outline of the ingot or the roll-passes) and yet a pencil of ungraphitized metal occupy the very axis? Third, the sharp line of demarcation between structures is very peculiar. Fourth, the ease with which the graphite carbon is redissolved upon annealing even for a short period, as pointed out by RAWDON and EPSTEIN, is surprising, in comparison with the rather stable conditions obtaining in other portions of the bar having a light fracture but also containing considerable graphite. Fifth, long heating at a rolling temperature seems to be one of the works conditions favoring graphitization; but if this temperature is in the austenitic area of the equilibrium diagram, the carbon or carbide would be uniformly distributed in solid solution with no tendency to segregate.

From a commercial point of view these questions have real importance, for we are assured that sometimes steel with black fractures arrives by the ton, instead of by the bar, as found by Mr. GREEN. Consequently the reasons for its occurrence should be determined with the greatest possible precision. From a theoretical point of view it has interest almost as great. We find it difficult to accept the dictum, "Graphite is the stable form of carbon," as a self-evident and sufficient premise from which to explain all the facts surrounding the graphitization of cementite—either in tool steel, gray cast iron or malleable iron. Since all the irons and steels which graphitize easily contain important amounts of many elements other than iron and carbon, it does not seem apparent on the face of it that the iron-cementite system is doomed forever as "metastable."

The Proper Training Of a Chemical Engineer

A SUBSCRIBER whose comments are always illuminating to us and who, although a manufacturer of heavy chemicals, is without professional training and has not been in his present occupation more than a few years, writes us about the way he is training a student of chemistry in whom he is interested. We may say that in the short time of his engagement in chemical industry he has insisted upon being taught the nature of every technical problem in his work, that he has accomplished large savings of wastes and that he has been successful. It may be that his previous experience in an industry that is chemical, although he did not know it, has opened his mind. Here is what he says:

"I have a young man associated with me who is in his first year of college. He is taking chemical engineering and will spend three months each year at my plant. This year he is helping the lead burner and will get a thorough knowledge of lead burning. Next summer he will unload hopper cars, heave coal, fire boilers under the instruction of our stationary engineer. Three months of that will give him a fairly good working knowledge of the process of the boiler, its economy and utilities.

"The next vacation he will spend in the plant operating digesters and other chemical equipment, then, when he graduates, I will take him into the office and let him handle shipping, accounting, telephone work, payrolls—in fact, all the various things that go to make up a man's commercial education. *After that* he will be permitted to go into the laboratory and start to work on the things for which he was educated. He will then realize that making mud pies in a beaker in ounce quantities is quite different from making them in 100-ton lots in great steel retorts and digesters. He will also realize that it takes labor to produce chemicals commercially. If he does not make a good successful chemical engineer of himself with that opportunity, I shall give up and admit I don't know how to train boys."

If he does not succeed with the young man in question, it will be the fault of the young one, and not the old. It is well for every student to bear in mind that business, properly administered, is one of the most difficult of arts and that he can never be fully in the game of manufacturing unless he has a clear sense of business.

Readers' Views and Comments

Chemists in Public Life

To the Editor of Chemical & Metallurgical Engineering

SIR:—Randolph Bolling in his letter appearing in your issue of Sept. 6, commenting on S. L. Redman's communication concerning "Chemists in Public Life" seems to indicate the soul of a chemist in the statement, "We just want to be left alone."

A splendid isolation seemingly is the main desire of chemists. They prefer routine. Anyone who has tried to get a rush test for control work in industrial processes can verify this tendency of chemists. A laboratorian simply can't be rushed. Possibly $1,000 may be at stake—he should worry, just so long as his 2 cents worth of this and 1 cent worth of that react on a sample that costs nothing according to all the rules and the classics.

Chemists assuredly must be in public life. They should live, not as hermits, as alchemists, but as men. All the angles of modern industrialism demand analysis, and after analysis comes decision. Certainly analysis of all the facts is much more involved than a grouping of chemical elements, often sadly done empirically, and the man best equipped to make the analysis is a chemist who appreciates business. Public life is business, not politics, and most if not all our universities provide an elective if not compulsory course in "business" or "efficiency," in which a certain amount of vocational guidance is provided in the order of things. The chemist with the spirit of "we just want to be left alone" habitually neglects this offering. The great teacher on the order of things is commercial experience, and the wide-awake chemist, the real analyist, should welcome offerings of positions such as Mr. Redman mentions, and not desire to be a hermit, for hermits have been known to starve to death.

SIDNEY CORNELL.

New York City.

Proteins and the Theory of Colloidal Behavior

To the Editor of Chemical & Metallurgical Engineering

SIR:—In your issue of Aug. 23 there appears a review by Jerome Alexander of Loeb's excellent book "Proteins and the Theory of Colloidal Behavior" that appears to me very unfortunate because it may give those of your readers who have not seen Loeb's book the erroneous impression that his work is not fundamentally sound, whereas it is evident that Alexander has failed to grasp Loeb's ideas. For example, he regards Loeb's thesis as standing or falling with the assumption that gelatin is a definite chemical entity. On the contrary, Loeb's theory is quite independent of this assumption; it assumes only that a highly ionizable chloride of gelatin is formed when gelatin is brought into contact with an aqueous solution of hydrochloric acid, and this is substantiated quantitatively in so many different ways as to give it a place among the facts of physical chemistry. Whether or not Loeb's gelatin was a mixture of proteins of variable molecular weight has no bearing upon the fundamental conception.

Loeb, as well as Procter and Wilson, has proved that the equilibria of aqueous protein systems are determined by the Donnan equilibrium, and it seems significant that no other view has ever passed the stage of qualitative speculation. Alexander's reference to "the adsorption view" means nothing, since adsorption as something distinct from the equilibria described by Loeb has not been resolved into anything more than a vague conception, which I believe will prove to be nothing more than a flight of the imagination of those who have tried to dodge the mathematics of the Donnan equilibrium.

I regard Loeb's book as marking the greatest advance yet made in this field and recommend it unreservedly to all interested in the subject indicated by its title.

JOHN ARTHUR WILSON.

Milwaukee, Wis.

Modern Handling Methods in the Manufacture of Electrical Porcelain

To the Editor of Chemical & Metallurgical Engineering

SIR:—With reference to the article which appeared in *Chem. & Met.* for July 12, 1922, entitled "Modern Handling Methods in the Manufacture of Electrical Porcelain," I have read this article with much interest. An article in the May *Journal of the American Ceramic Society* dealing with the same subject has also been brought to my attention.

I have carefully read these articles and, while we manufacture strictly sanitary plumbing fixtures and do not manufacture anything in the electrical porcelain line, still such papers are of great interest to us. There are a number of methods used in the manufacture of electrical porcelain that can be adapted to the sanitary line. There is no question that the pottery industry has been the slowest in putting in modern labor-saving devices; but I believe that the time is rapidly coming when the pottery industry will learn that it is best for it to use labor-saving devices as used in other industries, where they have been found to pay for themselves many times over.

It is becoming more necessary every day that the manufacturer cut down his manufacturing expenses so that he will be able to manufacture his wares at a minimum cost. If it is ever expected to reduce costs to what they were 10 years ago, the only possible way to do this is by the economical operation of the factory and by every possible labor-saving device that is practical to put into service. The price of labor will not go back to what it was 10 years ago; and for that reason the only way to reduce and keep costs down is by the careful and close study of the operation of the factory.

It is by such papers, read before the American Ceramic Society and published in the technical journals, that we conceive ideas and suggestions; and from these develop practical operations that are of great benefit to the industries.

TRENTON FIRE CLAY & PORCELAIN CO.,
PER O. O. BOWMAN, 2ND.

Trenton, N. J.

Eighth National Chemical Exposition

Report of the General Meetings and Technical Sessions, Including Symposia on the Paper Industry, Technical Photography, Ceramics and Standardization—Attitude of Anti-Saloon League Toward Manufacture and Sale of Industrial Alcohol

EDITORIAL STAFF REPORT

THE Eighth National Exposition of Chemical Industries, which was formally opened on Monday evening, Sept. 11, marked the return to Grand Central Palace after an enforced absence at the Armory last year.

Interest in the technical programs centered in the address of Wayne B. Wheeler, general counsel for the Anti-Saloon League, who spoke on "The Attitude of the Anti-Saloon League Toward Industrial Alcohol." Chemical manufacturers wanted to know just what this attitude is, and were particularly glad of an opportunity to have Mr. Wheeler express it. Mr. Wheeler was introduced by Dr. Charles H. Herty, who presided.

ADDRESS OF WAYNE B. WHEELER

The substance of his presentment was that the organization he represents is in largest possible sympathy with the alcohol industry in its industrial aspect, and with chemical industry at large. He said that the organization's slogan is that the more alcohol we can get into industry and the less we get into people the better it will be all around. He was very particular to emphasize the statement that the Anti-Saloon League is strongly and urgently in favor of the widest manufacture and use of industrial alcohol. Following this, he noted that the Anti-Saloon League and the producers of, dealers in and users of industrial alcohol thus had a common purpose, which he construed as not only the development and furtherance of the alcohol industry as applied to arts and manufactures, but also in the prevention of its use as a beverage. For instance, he said, "You have a common purpose with us in keeping this trade within the scope of its purpose." Again, "When people have a common purpose they should get along."

He called attention to the fact that the present regulations in regard to tax-free alcohol are fewer in number than before prohibition, and that, while only 2,000 000 gal. of tax-free alcohol was sold in 1906, there was 35,000,000 sold in 1919. "But, remember," he shouted, "the alcoholic is here with his thirst!" And he went on to say that, while some regulations to prevent its unholy quenching may be a little burdensome, no burdensome regulation would have the backing of the friends of the Eighteenth Amendment so long as it did not encourage drinking. The close of his speech centered more and more on the obligation to society of the tax-free alcohol and chemical industries to enforce the Volstead act (which he did not once refer to under this name) and the provisions of the Eighteenth Amendment. It was a shrewd speech that may be used as an argument in favor of any kind of restrictive legislation unless chemical industry will pay the price of dropping everything and starting on the hunt for bootleggers. "Some method is necessary," he said, "to check up where alcohol goes!"

THE REACTIONS TO MR. WHEELER'S SPEECH

After discussing the address with others who heard it we find that some thought that Mr. Wheeler had shown great growth in his concept of industrial alcohol and that the prohibition slogan, heard all too often, that "all alcohol is booze, anyway," is losing force with the chief representative of the Anti-Saloon League, the strongest organized prohibition society.

That the government, through the corruption of its enforcement agents, is failing to suppress the liquor traffic is a point which the speaker missed. We doubt if many unauthorized sales of alcohol are made in the first instance. We are convinced that all legitimate producers keep their accounts clean. The alcohol usually leaves the warehouse with a clean bill of health, duly attested by an authorized permit. That is all we can properly ask of the seller. Purchaser No. 1 may be wholly honest and hold the goods strictly to legal requirements, refusing to part with them save under proper authorization. By the time it reaches purchaser No. 2 the original seller has lost track of it. Purchaser No. 3 or No. 4 may and probably does show a duly certified authorization, but after he has had it he may turn the alcohol into potable liquor. Mr. Wheeler said (in the manuscript prepared for the press which we have before us): "The industry itself must take into account the fact that it is handling a commodity which is liable to produce great evil. It must help in the policing of the commodity—so as to prevent the evils which might otherwise follow." We fail to see how "the industry," which has none of the facilities of search enjoyed by the government, can find out what is done with the property of others, or even that it should if it could. The cheerful wholesale bootlegger who went to Canada with an authorized and approved certificate for the purchase of 250 cases of Scotch whiskey "for sacramental purposes" and got away with it into the United States represents the kind of leak which the industry cannot control.

Chemists, like clergymen and teachers, belong to the poorly paid professions, and few of them drink, for economic reasons, no matter what their opinions of the law may be. The real hindrance to enforcement lies in the fact that a great number of otherwise law-abiding citizens are so firmly set against the prohibition laws that they do not propose to observe them and are willing to take the consequence of their infringements if they are found out. The Haig & Haig distillery in Scotland, despite greatly restricted sales in Great Britain, owing to the tax of eight and five pence the bottle, declared a dividend of 18 per cent this last year, which would have been 34 per cent, as we recall it, but for the income tax. Its product comes here.

CHANGE IN PUBLIC OPINION NECESSARY FOR EFFECTIVE ENFORCEMENT

The real trouble lies in public opinion, which has not as yet matured to catch up with the law. The call for help from the industry by the Anti-Saloon League has been granted in many ways, but the demand that it shall aid in "policing" the sale of alcohol after it has left its control under government certification seems to us to be asking more than is fair.

The S.O.C.M.A. Meeting

Dr. Herty was again in evidence on Tuesday, for the afternoon session of that day was under the direction of the Synthetic Organic Chemical Manufacturers' Association of the United States. As president of that organization he dedicated the meeting to the purpose of convincing the public that synthetic organic chemicals included not only dyes but medicinals, perfume materials, photographic chemicals, explosives and a great many other products. The first speaker was Burton T. Bush, president of Antoine Chiris & Co., whose subject was "Synthetic Perfumes."

Synthetic Perfumes

Perfumery is an art and always will be, according to Mr. Bush. But just as the chemist has improved the work of the artist in other lines by giving him finer colors, purer oils and better paper, so the perfumer will be benefited by the contributions of this science. He will be given a wider range of materials with which to work. The odors of the lily of the valley, the lilac and other sweet-smelling flowers which are impossible to obtain by any known physical means have already been duplicated with a fair degree of success by the organic chemist, and many more are to come. Here, indeed, is a fertile field calling for the highest type of synthetic chemistry.

H. E. Howe spoke of chemistry as productive science. The fact that the volume of manufactures has increased four times since 1880 is due largely, in his opinion, to the two sciences of chemistry and physics, which through improvement in process and equipment have made this advance possible.

Synthetic Organic Medicinals

The session was concluded with an address by Dr. Frank R. Eldred, who took for his subject "Synthetic Organic Medicinals." "From the standpoint of health and happiness," he said, "there can be no more important application of organic chemistry than in the production of substances for the relief of suffering and the cure of disease. During the last few weeks the medical profession of the country has protested in no uncertain terms against the executive and legislative acts that threaten to wipe out all of the progress which we have made in the manufacture of synthetic organic medicinals since we were cut off from the former German source of supply during the war. We have just cause to be proud of the fact that the manufacture of every important medicinal product has now been established in the United States and that in quality these products are equal and in many cases superior to the German medicinals."

Peace-Time Uses for Poison Gas

Ellwood Hendrick was the genial chairman of a well-attended session on Tuesday evening. The first speaker to be introduced by him was Brigadier-General Amos A. Fries, chief of the Chemical Warfare Service, U. S. Army. The committee had asked General Fries to speak on the elimination of insect and other pests and he said he was inclined to believe that the latter category included the human pest, which "combines the deviltry of all other known pests." But speaking in a more serious vein, the General was able to show many important peace-time applications of the various toxic and tear gases developed during the war. Insect and animal extermination is one of these applications, so is mob control and the protection of life and property. The co-operative work of the Chemical Welfare Service and the Department of Commerce in studying the boll weevil problem of the South was cited as an example of a very practical application of our knowledge of poisonous compounds.

Another great economic problem to which some attention is being given is the control of the teredo and limmoria that destroy piling in sea water. The tremendous losses from these pests have already been partially stopped by the use of creosote, but it is the present belief that a poisonous compound of most specific action will soon be found.

The Chemical Warfare Service has worked with even greater success in destroying gophers, rats and other rodents so destructive to pastures and fields and which also carry fleas or other insects that may infect human beings with the bubonic plague. It is now engaged in a study with the Philippine authorities on the adaptation of poisonous compounds to the destruction of the locusts that cause great loss to crops in the Philippine Islands.

Replacing HCN in Ship Fumigation

An interesting development of recent months has been the help given the Public Health Service in preventing accidents in fumigating ships. It has been shown that cyanogen chloride, a war gas well known though not much used, is probably a better vermicide than hydrocyanic acid gas itself. It is a powerful tear gas in concentrations only one-eighth that which is dangerous, so that accidents are completely guarded against. No human will resist the blinding tears produced by this gas, even in concentrations too low to be dangerous, any longer than is absolutely necessary to get out of the way. This will not only make the fumigation of ships safe, but should lead to the extensive use of cyanogen chloride in the fumigation of houses, factories, etc., in place of more dangerous and less efficient germicides.

The Place of Research

General Fries took a strong stand on the question of continuing fundamental research along these lines. In this connection he said:

> The one place where America fell down in the war was in producing the special technical supplies needed in war, in time for general use. In making a fetish of practicability, we lost sight of the necessity for deep research. If we will only learn to apply continually the lesson that deep research alone will enable us in the future to maintain our place in the sun, the benefits of the war will in time outnumber the losses.

Chemistry Viewed by a Southerner

The chemical industry has a loyal and able friend in the person of United States Senator Joseph E. Ransdell of Louisiana. It is most significant that as a member of the political party opposed to the protective tariff Senator Ransdell has been a stanch supporter of high duties on all chemical products—believing, as he does, that these are "essential to the proper development and maintenance of industry in this country." His address is in part as follows:

> Chemical industry in the United States should be developed along the broadest and most comprehensive lines for three reasons:
>
> *A*. Chemistry is essential to the successful prosecution of practically all the arts and sciences. In fact, there is no industry of modern civilization which does not require the constant aid of chemistry to its successful application. Therefore, we cannot afford to be dependent upon the chemists of any other country, and should develop every branch of the art in America.

B. The wonderful advance in chemical inventions and discoveries during the past century warrant us in believing that innumerable things are still hidden which will respond to intelligent, persistent effort on the part of chemists. Many of the diseases of man have been greatly ameliorated by chemical inventions and discoveries of recent years, such as aspirin, novocaine, salvarsan, etc. Why can we not expect the discovery of remedies that will give relief, and possibly effect cures, of such diseases as leprosy, cancer, pneumonia, tuberculosis, and others which afflict mankind so terribly?

C. It is unfortunate that nations of the world cannot remain at peace and ignore all preparations for war, but so long as this greatly desired end seems still in the distant future it behooves wise men to prepare for possible conflict. Most thinkers agree that the next war will be decided by chemical preparedness and foresight of the contestants, and that it will be a chemical war.

Possibilities in the South

In concluding his remarks the speaker reviewed the wonderful possibilities for chemical development in the "land of Dixie." After touching on such well-known industries as naval stores, phosphate rock and cottonseed oil, he spoke of the South's great wood pulp resources—as yet entirely undeveloped. He declared that more than enough wood is being wasted annually in the Southern States to supply the country's requirements for all kinds of paper.

The chemist and the chemical industry will find in the single state of Louisiana the following resources awaiting exploitation: Limestone, sulphur, lignite, clay, salt, oil, gas, cotton, wood and sugar. Surely these are the basic raw materials for a remarkable industrial development.

Governmental Co-operation With the Chemical Industries

C. R. DeLong, chief of the new Chemical Division in the Bureau of Foreign and Domestic Commerce, told how the Department of Commerce under Secretary Hoover's direction is becoming of real service to industry. The Chemical Division has for its particular field the general inorganic and organic chemicals, drugs and medicinal preparations, essential oils, perfumery and toilet preparations, pigments, paints and varnishes, fertilizers, explosives and pyrotechnics.

Some of the ways in which the division can be of additional service were outlined by Mr. DeLong as follows:

> One of the important considerations is the means at the disposal of the bureau for the collection of information relating to foreign markets and industries. The department maintains twenty permanent offices in the important commercial centers of foreign countries. These offices are in charge of business men and economists acquainted with the commercial conditions surrounding the trade of each particular country. In addition, the department enjoys the co-operation of more than five hundred consular officers of the State Department. It is evident that these outposts of the government form a vast network of lines of communication on conditions in foreign countries. These representatives are constantly forwarding to the department at Washington inquiries for American goods and information on the competitive conditions which are met with in the individual countries of the world.
>
> These representatives are in a position to advise American firms and manuafcturers as to agencies qualified to handle their products, as to the customs duties in force in the various countries, and as to other commercial regulations governing the sale of products in a particular country. This information on the world's markets, as received, is centralized in the various commodity and regional divisions of the Bureau of Foreign and Domestic Commerce. Here it is carefully studied and abstracted before being distributed to American industries. I believe that through these sources the Chemical Division will be able to assemble in Washington accurate and detailed information on the world's production and requirements for chemical products.

An Example—Caustic Soda in Germany

For the intelligent exportation of products it is necessary to keep in constant touch with changing conditions in the various markets of the world. For example, one would not ordinarily consider that there would be a market for American caustic soda in Germany, yet information reaching the Department of Commerce recently shows that there is an apparent shortage of caustic soda in this market, and that the demand is being largely supplied by the United States. As a matter of fact, approximately one-half of the caustic soda being imported by Germany is originating in this country. It can therefore be seen that with rapidly changing market conditions it is necessary to keep in constant touch with the various foreign markets if advantage is to be taken of these opportunities to sell American chemical products abroad.

In order that American firms interested in the exportation of chemical products may receive the benefit of confidential information on trade opportunities in foreign countries, the department maintains a classified list of American exporters and manufacturers, which is known as the "Exporters' Index." It should be emphasized that only American-owned firms interested primarily in the promotion and sale of products of domestic manufacture are eligible for listing on this "Index." A firm once listed on this "Index" is entitled to receive without charge confidential information on trade opportunities, such as financial references, reputation and standing of the firm making the inquiry, and other information helpful in the marketing of a particular commodity in a foreign country. Such firms are also entitled to receive, whenever requested, trade lists of firms capable of handling their products in foreign countries.

Statistical Information

The department can be of further aid to the chemical industry by supplying accurate and detailed statistics of the trade in chemical commodities, both in the United States and in foreign countries. It is essential to the intelligent conduct of business to know the extent of domestic and foreign markets, the degree to which these demands are being met, and the countries supplying the products. It is planned that the Chemical Division shall make a periodic analysis of domestic and foreign trade statistics so as to make available the extent of the world's trade in chemical products.

A recent gratifying advance has been made in this direction in the case of the statistics for sulphuric acid and acid phosphate produced by the fertilizer industry, through the co-operative efforts of the National Fertilizer Association and the Bureau of the Census. That bureau has recently published statements showing the production, stocks and sales of these products for the first 6 months of 1922 and, it is reported, will continue the collection of such statistics for 6-month periods. It is to be hoped that other branches of the chemical industry will see the advantage of such statistical information and that it will only be a short time until such statistics have been expanded to include other basic chemical commodities.

Co-operation of Industry Necessary

Trade associations and individual manufacturers should not wait for an invitation from the department to co-operate with the Chemical Division. The division is beginning to function, and has been established for the sole purpose of facilitating contact between the department and the chemical industry. It is earnestly desired that the industry will come to consider that the Chemical Division is a part of the industry itself and that it is the industry's means of contact with the government. We want trade associations and individual manufacturers in the chemical industry to feel that they can lay their problems before the division with the knowledge that their confidences will be respected and that we will endeavor to aid them in solving these problems by every means at the disposal of the department.

Carbon Dioxide in Food Products

P. W. Heath presented a paper on substituting carbon dioxide for air in food products. He said the

American people spends millions of dollars each year for bread, butter and ice cream, but doesn't know that 10 per cent of the volume of butter is air, and so, too, is 40 to 50 per cent of the volume of ice cream. What Mr. Heath recommends, and we are informed that he has patents which cover the process, is the provision of an atmosphere of CO_2 to cover the materials during the processes of kneading or agitation, in the place of air.

Carbon dioxide thus provides various distinct advantages. Milk fresh from the cow's udder contains 10 per cent CO_2 by volume. Half of this escapes shortly after milking, and a quarter more is lost through pasteurization. To bring milk back to an approximate normal condition he recommended the introduction of 22 oz. of CO_2 into every 1,000 gal. of milk. He said that CO_2 improves the flavor of foods when good raw materials are used, and that it stimulates the nerves of taste and smell.

He quoted a bulletin of the U. S. Department of Agriculture of 1916 on the progressive oxidation of cold storage butter. In this it is said that in 2½ days under storage at freezing point temperature, one-eighth of the imprisoned oxygen in butter becomes chemically combined and over three-quarters becomes combined in less than 2 months, and that the production of off flavors in cold storage butter is attributable to slow oxidation. CO_2 is approximately free from dust, whereas ordinary air contains from 20,000 to 40,000 visible dust particles per cubic inch, and CO_2 treatment tends to keep out molds, yeast and bacteria.

Ice cream beaten in air contains from 25 to several hundred per cent more bacteria than ice cream beaten in CO_2, while butter churned in the same medium shows a greater reduction.

The destructive effect of air on vitamins A and C was discussed, and many instances given to prove it. At the University of Minnesota, butter intended for animal feeding is kept under an atmosphere of CO_2 to conserve its vitamin A. He quoted McClendon of the University of Minnesota, who powdered orange juice by spraying it respectively into hot air and hot CO_2. Vitamin C was destroyed in the air-dried material while 1 oz. daily of the CO_2-dried juice protected 500 guinea pigs from scurvy. Three years ago, he said, only two Western cities were mixing foods in CO_2 instead of air. The practice is now becoming general.

Mr. Heath was introduced by E. D. Hale of the Liquid Carbonic Co. of Chicago.

Pulp and Paper Day

In arranging the program for the meeting of the Technical Association of the Pulp and Paper Industry held Wednesday afternoon, Sept. 13, a departure was made from the usual custom of having problems of pulp and paper technology presented by men in the industry. Instead, representatives of firms exhibiting equipment and devices used in this field were given an opportunity to explain these in detail.

A few of the papers dealt with equipment devised particularly for the paper industry, others covered the application of standard machines to specific problems in this field, while still another group treated such general subjects as draft gages, CO_2 recorders, steel belts, the V-notch meter, recording instruments and methods of testing for fastness to light.

Under the first classification came a paper by E. J. Trimbey, of the Trimbey Machine Works, describing a meter for use in conjunction with an automatic consistency regulator in controlling the proportional volumes of ground wood and sulphite pulp where these are used in the form of soft stock. Color and size may be regulated in the same manner. Individual drive with d.c. motors connected to a motor-generator set makes it possible to vary the proportion of any constituent, or to vary the speed of the whole system without changing the proportions by means of a rheostat on the generator.

Continuous Causticizing and Filtration

Among the more important papers stressing the application of standard equipment to paper mill problems were the following:

W. D. Mount, of the Glamorgan Pipe & Foundry Co., demonstrated the advantages of the continuous causticization process in which the lime moves in a cycle through the following equipment: continuous causticizer, decanter, rotary filter, rotary kiln, continuous lime slaker.

Further information on the use of rotary filters for handling sludge from the causticizing process was given by G. D. Dickey, of the Industrial Filtration Corporation, and H. A. Morrison, of the Oliver Continuous Filter Co. Mr. Dickey also pointed out the possibility of washing paper pulp efficiently on rotary hopper dewaterers. Other applications of the continuous drum filter were considered by Mr. Morrison, particularly for brown stock washing, thickening before bleaching and in place of deckers and save-alls.

Meeting of Technical Photographic and Microscopical Society

Members of the Technical Photographic and Microscopical Society were well satisfied with the interest aroused by the large collection of photographs which constituted the society's exhibit. There was a crowd before the remarkable aërial photographs of Manhattan Island constantly, while photographers and technical men who investigated more carefully the work displayed learned much of the latest developments of the art and its numerous applications to industry and scientific research. Consequently, it was an enthusiastic group of members who assembled on Thursday, Sept. 14, for the annual meeting of the society in the large conference room at the Grand Central Palace.

Reports were submitted by officers and committees. Officers for the coming year were elected as follows: President, Prof. E. M. Chamot, of Cornell University; vice-presidents, Bennett Grotta, Atlas Power Co., J. A. Lucas, McGraw-Hill Co., C. E. K. Mees, Eastman Kodak Co.; secretary-treasurer, T. J. Keenan, editor of *Paper*. A vote of thanks was extended to the retiring officers for their efforts in establishing the organization on a firm basis.

Technical Sessions

The program arranged for this meeting was extremely broad, ranging from the general subjects of pulp and paper manufacture to wireless telephony, the one common idea being the application of photography and microscopy to the various subjects. Unfortunately, the program was too long for the time available and several of the papers had to be read by title.

One of the most interesting subjects presented was Henry Green's discussion of "The Photomicroscopy of


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AMEND

Paint and Rubber Pigments." Mr. Green described the work of the New Jersey Zinc Co. in the development of zinc oxide and other pigments.

Photomicrography in Paper Research

"Photomicrography in Pulp and Paper Research Problems" was the title of a contribution from the Forest Products Laboratory prepared by Eloise Gerry and E. M. Diemer and read by the secretary. The paper was illustrated by numerous lantern slides showing the method of distinguishing woods by means of the microscope. Woods of similar appearance, such as red gum, birch and mahogany, are clearly distinguished by their totally different cellular structure under the microscope. It was interesting to observe the accuracy to which the mechanical strength of a wood can be estimated by a study of its structure. The samples observed under the microscope ranged from $\frac{1}{5,000}$ to $\frac{1}{800}$ in. in thickness.

Examples of the valuable information contributed by photomicrography in the manufacture of sulphite and soda pulp were shown, such as the marked effect of beating in the two processes. Another very practical application of the microscope was revealed by photographs showing the formation of the gum ducts in various conifers. By a careful study of this formation the cut can be made in such a way as to increase materially the yield of gum from the tree.

D. S. Mungillo presented a reel of motion pictures showing the methods used in a modern motion picture laboratory. This was followed by a brief description of modern machinery for developing, fixing, drying, printing and polishing.

The Motion Picture in Industry

The motion picture as an aid to industry was discussed by Alfred B. Hitchins, director of the Ansco Research Laboratory. Dr. Hitchins pointed out the fields in which the industrial movie is beginning to be utilized. It is of value for purely scientific problems in throwing light on the mechanism of natural phenomena, for the education of workers by reducing waste motion and eliminating unnecessary details in shop work and for sales demonstrations. Obviously, there is no more effective way of conveying a message than by a visual presentation of the story. It is possible to present any idea in an interesting and dramatic manner by using the artifices of photography for which the modern camera is equipped. By the use of the slow speed camera, motion can be synthesized, while for its analysis the ultra-rapid camera is admirably adapted.

An interesting example of the practical application of the motion picture to mechanical stoker construction was described. Motion pictures were made of the stoker in operation, the camera protected from the intense heat by a series of Pyrex glasses set in asbestos and cooled by a stream of air. One exposure was made every 8 seconds, with the result that so much additional light was thrown on the actual working of the machine that the engineers were able to design a much larger and better stoker.

John Mills, of the Western Electric Co., gave a talk on the principles of radio-telephony and the operation of the audion. Aside from the general interest in the subject matter, the audience was impressed with the facility with which a complex description of a highly theoretical subject was reduced to a very simple explanation by means of animated diagrams. It was a good example of the educational possibilities of motion pictures.

Clarence W. Gibbs described some of the most recent developments in motion picture photography and outlined some of the refinements and improvements that are being studied and tried.

A film entitled "Thirsty Cotton" was projected, accompanied by a talk by Thayer Francis of the Parks-Cramer Co. Some of the views showing the effect of moisture on the tensile strength of cotton and its appearance under the microscope were especially interesting.

Colors That Please Us

Giving a popular talk on synthetic organic chemistry before an audience that included several well-known dye chemists as well as a number of individuals who wandered in because someone gave them tickets is obviously no light pastime. M. L. Crossley, of the Calco Chemical Co., undoubtedly realized this when he prepared the paper which he delivered Tuesday evening in the conference room at the exposition. It was an earnest attempt to convey the story of the American synthetic organic chemical industry to the public.

Dr. Crossley had prepared a spectacular chart headed "Evolution of the Dye Race." He pictured "Adam" Coal, "Eve" Science and "Abel" Industry as progenitors of the race, showing the "descendents" of anthracene, benzene and naphthalene as dyed samples of cotton, paper, wood, wool, silk and leather.

The speaker outlined the history of the development of synthetic dyes up to the present time and dwelt upon the present status of the industry in the United States. He explained, in simple language, the relation between the dye industry and the organic chemical industry in general, but particularly its connection with national defense, sanitation and medicine. The interlacing of the dye industry with consuming industries was also discussed.

In concluding, Dr. Crossley touched upon the tariff situation, explaining that the continued existence of the industry depends upon adequate protection from the established German competition. He pointed out that the additional cost of goods to the ultimate consumer caused by the tariff would be practically negligible. As to the possibility of establishing a monopoly in this country, Dr. Crossley said, there is little possibility of such an occurrence, for about two hundred American manufacturers are engaged in the keenest competition. It is a case of choosing between this domestic competition and complete domination by the German cartel.

Ceramic Day

Friday afternoon the technical program was conducted by the American Ceramic Society, the general secretary, Ross C. Purdy, acting as chairman.

Feldspar Colloquium

A most important phase of the meeting was the feldspar colloquium. Some time ago dissatisfaction on the part of users of feldspar with regard to quality and price prompted R. B. Ladoo to make a thorough investigation of the situation. The publication of his report on feldspar and feldspar grinding brought forth much comment and considerable space in recent issues of the *Journal* of the American Ceramic Society has been devoted to the publication of discussions on this subject.

Several further contributions were received far

enough in advance of the meeting so that it was possible to have them available for distribution in mimeographed form. The papers read were chiefly comments on the mimeographed material.

The necessity for agreeing upon standard specifications was pointed out at length in a report by W. H. Landers. As the requirements of the three great groups of users—the manufacturers of pottery and tile, enamel ware and glass—differ considerably in many particulars, it will probably be necessary for each group to outline its own standards rather than attempt any uniform specifications for all users. In many cases little exact information is available regarding the effect of various impurities in specific applications.

Take the case of iron. With the exception of the glass trade, where the effects of iron are definitely known, it does not seem clear, outside of the question of forming black specks in the ware, just what results from the presence of iron, and whether the same effects are obtained from the various oxides of iron as are noticed from metallic particles only. In addition to the iron which occurs naturally with the feldspar, appreciable amounts may be added as a result of carelessness during mining, grinding and handling.

After considering a number of other factors, Mr. Landers turned to the question of fineness, which must be considered from the users' standpoint. For the potter, it is customary to grind so that less than ½ per cent remains on 140-mesh Tyler standard screen. The enamel trade would like to get a feldspar free from lumps, which would leave no residue on an 80-mesh screen and contain no material finer than 250 mesh, as the very fine material causes trouble by forming lumps. The glass manufacturer could quite profitably use feldspar which had passed through 40 mesh but remained on 100, and contained not over 10 per cent finer than 100.

The mutual benefit which would result from the adoption of workable specifications for each branch of the trade is self-evident.

In a paper discussing Mr. Landers' report, Raymond B. Ladoo emphasized the need for standardization and registered his hope that definite action be taken soon. He suggested that the whole subject of feldspar specifications for various uses be gone into very carefully by a committee composed of both producers and consumers of feldspar.

Other phases of this timely and important subject were presented by George M. Darby, O. O. Bowman, 2nd, V. A. Stout, C. R. Moore and C. M. Franzheim.

Fineness of Grind and Screen Analysis

Two other papers had a direct bearing on some of the topics considered in the colloquium. Eric Turner showed an apparatus for quickly determining the fineness of grind, which is the factor determining the finishing point when grinding such materials as feldspar and flint in the intermittent type of pebble mill. The residue obtained by washing a 300-gram sample through a 160-mesh brass screen of the Tyler testing type is washed into a long-stemmed funnel, where it is permitted to settle. The stem is graduated in tenths of 1 per cent, so that the percentage of oversize material may be read off directly.

The whole subject of the value of screen analysis in ceramics was treated in a most comprehensive way by F. P. Nickerson, of the W. S. Tyler Co. Illustrations were given of practical results obtained from the use of screen analysis curves in the form of either cumulative direct plots or cumulative logarithmic plots.

Gray Enameled Ware

Problems encountered in the production of single coat mottled gray enamel ware formed the subject of an interesting paper by Howard C. Arnold. Briefly, the points which have to be considered are these:

The black shape has to be covered completely in one coat. The lack of a second coat makes it impossible to hide blemishes and imperfections. This coat must have all the gloss, luster and appearance of a finish coat. The two colors must be produced from the same enamel in one dipping. The two colors must be present in correct amounts and so distributed as to produce a pleasing effect. The chemical reactions which produce the two colors in the single coat introduce many troubles not met in two or three coat work.

Gas Producers for Glass Works

A most instructive talk on the development of gas producers for use in connection with glass furnaces was given by W. B. Chapman, of the Chapman Engineering Co. By means of lantern slides the steps in the progress from the old stationary producer to the present mechanical type were clearly shown. Mr. Chapman also had a model of a new type of closed pot furnace designed to replace furnaces of the reversing type. The pots are set in a circle with the burner at the center. The flame passes over and down the sides of the pots, then through flues in the bottom of the setting, where some of the heat is given up to the incoming air supply in adjacent sets of flues. The gas is not preheated, as it comes from the producer at 1,000 deg. F.

Other Papers

High-temperature cements were discussed by W. H. Gaylord, Jr., of the Quigley Furnace Specialties Co., and Charles E. Kraus of Johns-Manville, Inc.

According to G. O. Dickey, of the Industrial Filtration Corporation, the difficulties of handling clay mixtures containing a large proportion of ball clay on rotary filters have been overcome in a special continuous filter which will handle any kind of clay. The removal of iron from clay slips and glazes by means of magnetic separators was considered by E. S. Hirshberg, of the Dings Magnetic Separator Co.

Chemistry in Medicine

At the Wednesday evening session Arch E. Olpp, a physician and member of the House of Representatives, was introduced. In discussing "Chemistry in Medicine," he mentioned the fact that originally the chemist worked to produce drugs for the physician and that later had come a not unnatural split—the chemist turning toward industry in the days of Agricola. Later the physician turned back to his former aid and found most useful substances awaiting him. For example, ether was discovered in the thirteenth century, but its value as an anesthetic was not definitely recognized until 1846; during the interval of five or six hundred years untold suffering resulted from the lack of knowledge of its application to produce insensitiveness to pain.

So today the medical departments and colleges are devoting much more attention to chemistry than heretofore, evidently realizing at last the great necessity of co-operation between these two sciences.

Dr. Olpp instanced a number of examples of the

chemists' skill in preparing drugs and medicines, one notable example being salvarsan.

By the study of the structures of the molecules of a number of dyes, the key to the whole mystery of color production and color quality has been gained by man. Therefore, by such conquests we can readily appreciate the necessity for the co-operating work of the chemist, biologist and physician in an ultimate conquest in the domain of life products.

Thus, for example, cocaine has at least forty-three atoms in the molecule, arranged in a peculiarly complex, labyrinthal fashion, and it took three successive attacks by leading chemists to reach a final solution of the problem.

It was found that only part of the molecule has the beneficent anesthetic effects of cocaine, while another is related to the deadly principle of hemlock, coniine, famous as the poison Socrates drank, and a third part is related to nicotine. And from this the chemist reconstructed new and less harmful drugs—procaine, beta eucaine, apothecaine, which are better than cocaine and less poisonous.

Government Regulation of Industrial Alcohol

C. P. Smith, Assistant Commissioner of the U. S. Internal Revenue Bureau, then discussed the government regulation of the industrial use of alcohol. He pointed out the three phases of the national prohibition act: First, to prevent the sale of alcoholic beverages; second, to encourage the manufacture of industrial alcohol, and third, to control the distribution of high-proof alcohol. The latter is a big problem and one phase of it is illustrated in the quotation given below.

"Heretofore applications of permits to purchase alcohol for manufacturing purposes have generally been granted where nothing can be found against the applicant. The result has been the granting of thousands of permits to persons desiring to manufacture hair tonics, flavoring extracts and patent medicines. The situation in the flavoring extract industry is demoralized. It is needless to say that much of the alcohol sold to these small manufacturers for industrial purposes is utilized in the making of 'bootleg' whiskey. It is very probable that there will come a time when a man must show more than that he has never served a jail sentence before he will be entitled to receive a permit to purchase pure alcohol for manufacturing purposes. That day will be hailed with delight by legitimate users of alcohol."

The American Chemical Society Meeting

On Friday evening, Sept. 15, the New York Section of the American Chemical Society held a meeting at the Chemical Exposition. A symposium on standardization had been prepared and a number of papers on the subject were to be presented. Dr. Martin H. Ittner, chairman of the New York Section, called the meeting to order and introduced Dr. W. D. Collins of the U. S. Geological Survey, who made a plea for moderation in standardization. The advantages of standardization are very apparent and it so happens that natural conditions of trade bring about a great amount of standardization without conscious effort. The author advises against ill-considered standardization as being costly, with losses which far outweigh the gains. The author conceived his text from the experience of the chemical laboratory apparatus manufacturers where an apparent capriciousness on the part of the consuming public may not be capriciousness at all and therefore too great standardization and too great elimination of existing types of apparatus may be distinctly undesirable.

I. G. Jennings, of the Glass Container Association, followed with a discussion of the problems which are to be met by this association in making standard specifications. Mr. Jennings recommended co-operation between the industry and the consumer and announced that his association would be glad to further such co-operation to the fullest extent possible.

The Hoover Method Explained

The chairman then introduced William A. Durgin, of the U. S. Department of Commerce, who told the Society about the Hoover idea. Mr. Durgin's talk was well illustrated with lantern slides and was on the whole very refreshing. He began by disclaiming any desire on the part of the Department of Commerce so to standardize life that the wearing apparel of the citizens would be uniform and that the size and shape of the clouds which hung over the city would also be standard, but he went on to outline the many advantages of standardization and gave specific examples from a dozen or more industries. Such things as berry baskets, writing paper, tile and brick and many other commodities have been standardized so that there are now somewhere in the neighborhood of 10 to 15 per cent of the number of kinds originally manufactured. The Master Car Builders Association has eliminated 96 per cent of the parts which formerly had to be kept in stock. This has effected a tremendous saving. The story of beds is another interesting chapter. Furniture manufacturers made beds of almost any size. In fact, they were rather hostile to the idea of standardization, stating that designers could not be hampered by dimensions. This led to an innumerable quantity of mattress sizes, which now have been cut down to a reasonable number. The Hoover method is, first, a publicity campaign in a particular field, then a scientific survey of the conditions in that field followed by a general conference of the manufacturers with representative consumers under the auspices of the Department of Commerce. It is essentially a peace-time application of the co-operation which we first learned was possible during the war.

Secretary J. M. Roberts of the Apparatus Manufacturers Association told of the advances which had been made in that field during the past year. The industry has had an interesting problem on its hands inasmuch as it is so new in this country. The first questionnaire sent out by the association gave 80 per cent full agreement by manufacturing firms and approximately 80 per cent agreement on the part of the consumers (through the American Chemical Society's committee) on the elimination necessary. There were originally 148 gas burners on sale in the country and 70 of these have been eliminated. Over 10,000 lipped beakers are sold to less than 100 without lip. Knowledge of this figure made possible an elimination of 31 out of 48 sizes. Similar corrections have been made in other types.

The next paper, by Ross C. Purdy, secretary of the American Ceramic Society, is printed in full on another page of this issue.

The symposium was closed by a set of pictures presented by Emerson P. Poste, of the Elyria Enameled Products Co., on standardization of enameled ware for chemical purposes. The pictures were most interesting and bore evidence that close co-operation exists among manufacturers of these materials.

Standardization of Refractories*

By Ross C. Purdy
General Secretary, American Ceramic Society

STANDARDIZATION of refractories has been the desideratum of manufacturers and users of refractories the world over for several years. Technologists and scientists have made researches and developed methods of tests; associations have adopted so-called standard tests and definitions; associations of manufacturers of refractories and associations of users of refractories have joined with the federal bureaus and with collegiate institutes in conducting searching investigations of the required refractory properties for each of the many industrial uses; individual industrial concerns, both producers and consumers, have been spending annually large sums of money in searches for refractories that would best serve specific purposes.

Co-operation Among Searching Agencies

This earnest searching has been in progress for years not alone in one country but in all the industrial countries. All these searching agencies, private, semi-public and public, associated and individual, have published freely their results and all have co-operated to their limit in every attempt to standardize tests and to write specifications for refractories for specific purposes. Technical and scientific societies have had research committees collaborating with all the institutional and industrial groups. Nothing has been left undone that could with intelligence have been done by any of these several agencies to hasten the day when standardizations and specifications could be agreed upon not alone in one country but also internationally.

Progress Has Kept Pace With Knowledge

Much exact information has been gained and great progress has been made by and through all of these efforts. The many things that apparently conflict are rapidly being aligned and the fundamental facts quite generally understood by the producers and the users alike. It would have been impossible to have made more rapid progress than has been made in determining the fundamentals of the problems involved. There can be no just criticism or reproach made because of inadequacy of our present knowledge of the fundamental requisites to the making of satisfactory standards and specifications, and that which I will relate as my understanding of the present-day situation should not be considered iconoclastic or critical. Nothing short of most sincere praise for and genuine satisfaction with the accomplishment to date should be expressed, but we must face the facts viewed in the light of the present-day requirements.

Increasing Severity of Industrial Requirements for Refractories

The industrial requirements for refractories have been steadily increasing in severity; the refractories that were satisfactory in the furnaces and with practices of the immediate past will not meet the present-day requirements. New demands, much more severe than any heretofore known, have developed with the introduction of electric furnaces and with the efficiency studies directed to lowering of costs of manufacturing, calling for certain properties not possessed by the refractories of the immediate past. It has been impossible to write specifications or to adopt standards that would for a reasonable period of time satisfactorily fit with the changing industrial requirements. This is not an alibi; it is not an excuse; it is merely a statement of facts.

Classification of Refractories

Refractories may be classified according to the material of which they are made; such as clay, flint clay, bauxite, diaspore, fused alumina, corundum, chrome, magnesia, zirconia, silica, silicon carbide, carbon, nitrides, etc. We are rapidly learning where each of these classes of brick serves best.

No one, however, can today intelligently sub-classify any of these types of refractories into No. 1, 2 and 3, or *a*, *b* and *c*, except in relation to some given property such as temperature range through which it resists tendency to deform.

The industrial condition in each and every case calls for a combination of several requisite properties in refractories, the emphasis on particular properties varying in what superficially appear to be identical requirements. Malleable iron foundries will have differing requirements. So will furnaces in other industries, depending upon the particular conditions of the individual plant operation.

Satisfactory Classification Not Possible With Present Knowledge

Classification of refractories as "heavy," "medium" and "light duty" based upon properties disclosed by standardized tests is, in a very general way, satisfactory for particular purposes, but the "heavy duty" refractory suitable for one industrial purpose will not be the "heavy duty" refractory for all purposes.

No classification of refractories yet made is satisfactory, and I confess frankly that I do not possess requisite information for recommending a satisfactory and just classification.

Standard Tests Do Not Check With Operating Results

Committee C-8 on refractories of the American Society for Testing Materials has compiled all the known information on methods of testing and has made very successful attempts to standardize the tests. The inadequacies in the standard tests as they stand today are due altogether to the inadequacy of our knowledge of industrial requirements. That the standard slag test fails utterly to disclose which of two blocks would resist slag corrosion in a cupola furnace is due wholly to the inadequacy of our knowledge of the cupola conditions and of the properties in refractories necessary to best meet them.

In a certain test, privately reported, two cupola blocks showed striking contrasts in results in the actual furnace test and in the standard slag test. In practice the slag did not penetrate more than 0.25 in. in depth, while in the standard test the penetration amounted to 0.5, 2.0, 2.5 and 3.5 in. In practice the penetration and corrosion were rather uniform, while in standard test it was not. In practice the *B* blocks were better by 400 per cent, whereas in the standard slag test the *A* blocks were better by 50 per cent.

The coarser grog blocks, *B*, although permitting greater penetration, actually resisted corrosion far better than did the *A* blocks.

A fair test of the present status of our scientific knowledge of the factors involved in this case would

*Paper presented at the Eighth National Exposition of the Chemical Industries, Ceramic Day, Sept. 15.

be to submit the analysis of these *A* and *B* blocks—as given in the accompanying table—to any ten ceramists or chemists as a basis for prediction as to which one of these blocks would most successfully withstand corrosion in a cupola furnace.

ANALYSIS OF CUPOLA BLOCKS

	A	*B*
Silicon oxide	52.70	57.84
Aluminum oxide	38.17	34.14
Ferric oxide	6.30	2.75
Calcium oxide	0.18	0.30
Magnesium oxide	0.13	0.58
Total alkalis	0.93	1.39
Totanium oxide	1.89	2.75
Total	100.30	99.75

A was made of finely ground material and hard burned and *B* was made of coarsely ground material and only medium hard burned. Both fused at cone 31.

Modifications Required for Specific Cases

It would require much more time than has been alotted to analyze critically all of the "standard tests" as to their inadequacies when applied to a given industrial requirement. All of them will be subjected to refinement as knowledge is obtained, but each and all of them represent the best that can today be written. This broad justification can be stated notwithstanding the fact that whenever a set of standard specifications is attempted for refractories for a specific purpose, good reasons have appeared for a modification of most of the standard tests.

Just recently a selected group of technical men representing the users and producers of boiler refractories wrote specifications in collaboration with the best informed ceramists in this country. When the specifications were applied, they found that over 50 per cent of the refractory bricks which were known to be giving satisfactory results were, according to the adopted specifications, condemned, while some bricks which were known to be unsatisfactory in boiler construction met the specifications satisfactorily.

Suitability and Control Tests

We can today specify "suitability" and "control" tests for refractories for specific purposes. The federal departments have done a great deal, as have many of the users of refractories, in determining suitability tests. These, however, cannot be used as the basis of standards or specifications.

Data on Service Conditions Needed as Well as Fundamental Facts

The American Society for Testing Materials and the Refractories Manufacturers Association are laying plans for a joint survey with the several industrial associations to obtain exact information concerning the conditions under which refractories are used. Based on this information the A.S.T.M. Committee C-8 expects to be able to prepare standard tests which will apply in each industrial case and the manufacturers and users will be able to decide upon "suitability" and "control" tests.

This sort of close co-operation on the part of the several industrial and technical associations, contemporary with the new fundamental facts which will be brought forth by the several laboratories, will hasten the clearing of the present apparent chaos. Then and only then will it be possible to standardize refractories.

Investigate Zirconia-Alumina Refractory Crucibles for Steel

Difficulty is experienced in obtaining a refractory crucible, other than ones of carbon, which will not react with the carbon in steels and give fictitious values for carbon monoxide. The most promising results obtained to date from crucible tests have been secured with a refractory of zirconium oxide (practically free from silica) with the admixture of 10 per cent of aluminum oxide. The latter addition is made for the purpose of improving the mechanical rather than the chemical properties of the crucible. A medium-carbon steel melted in this type of crucible was quite easily pumped free from gas while still molten and the carbon in the vacuum-melted metal was only slightly lower than in the original sample. It is, therefore, to be concluded that there is very little if any reaction between the oxides of this refractory and iron carbide even at high temperature and low pressures.

The results obtained on electrolytic iron by the direct fusion method and by the Gorens (antimony-tin alloy) method have been compared. The results for total oxygen are practically alike. The hydrogen is higher as determined by the Gorens method. The ratio CO_2:CO was found to be 1:1 in the Gorens method but 1:4 in the direct fusion method. These differences are probably to be attributed to the lower temperature required in the alloy method.

Runs have been made on a medium-carbon steel by the two methods. The results are not yet conclusive, since the type of crucible used for the direct fusion of the steel was of a composition different from the other crucibles used in the test.

Canadian Topographical Survey Equipped for Thermometer Standardization

Until recently the lack of proper facilities for thermometer testing in Canada was such that scientific laboratories and others found it necessary to send their instruments outside the dominion if tests of a high order were required. Since the Department of the Interior established a thermometer section at the Surveys Laboratory of the Topographical Surveys branch this procedure is no longer necessary. Thermometers tested at the Surveys Laboratory include precise instruments for scientific work and also industrial, clinical, high-temperature and meteorological thermometers. These thermometers are calibrated and their various constants and corrections determined in terms of the standard temperature scale.

The nearest approach to an ideal or absolute scale of temperature—i.e., one in which every degree is of equal value—is given by a thermometer in which temperatures are measured by the expansion of certain gases. Even this is not strictly accurate, but the deviations from the ideal scale can be calculated. The gas thermometer is a very elaborate apparatus, and it has been found that a thermometer in which temperatures are measured by the electrical resistance of platinum wire will produce the absolute scale to a high degree of accuracy, if calibrated at several points on this scale. Hence this thermometer is now generally used as a reference standard for accurate temperature measurements by such institutions as the Surveys Laboratory.

With the precision now possible in scientific measurements appliances for testing thermometers must be of special construction and provided with means for closely controlling and measuring the temperature.

Sidelights on the Exposition

Random Impressions Indicate That the 1922 Exposition Made a Greater Appeal to Utility Than to the Colorful and Garish—Notes on Interesting Things, Both New and Old, Which Were Exhibited in an Attractive Manner

CONTRASTING the Chemical Show with the one held last year and with the earlier ones of previous years, it might be said that the industry has taken off its frock coat, and even its collar, and rolled up its shirt sleeves and was there for business. There were very few, or relatively few, spectacular exhibits appealing to the popular eye rather than the scientific eye, which have marked the earlier shows. But there was a wealth of technical material, which made the show extremely profitable.

CONSIDERABLE INTEREST was evidenced in the vegetable chars on exhibit. Darco and Suchar seem to be traveling much the same road that Norit traveled about 4 years ago, before the vaulting ambition of its inventor o'erleaped itself. These chars have been tried out on plant scale and results have been satisfactory, but the length of use of the chars and the possible regeneration of them has only been touched on. That is the ultimate stumbling block for all chars in sugar work.

MATERIAL HANDLING is coming more and more into its own in chemical industry, and therefore it is not strange that a miniature material handling exhibit, such as the Dow Company of Louisville, Ky., put on, was observed with great interest. Of course, we none of us quite outgrow the joy of seeing the wheels go round, and even now you will see grown men crowd around F. A. O. Schwartz's window and watch little electric trains glide around on tracks. And it may have been some such impulse that made the crowd pause and watch the little boxes and barrels go up the belt conveyors and around down the incline rollers on the Dow apparatus. In any case, it was one of the high spots.

PERHAPS it was a similar childish impulse that made the crowd revel in the little models of plants for making bleach out of liquid chlorine, which were put on by both the Electro Bleaching Gas Co. and by the Mathieson Alkali Co. Both of these exhibits were quite significant because they illustrate conclusively the importance which liquid chlorine is assuming in industry. It is much easier to transport than bleaching powder, and with equipment such as was shown in the models is extremely easy to handle. It is likely to be an increasing factor in those trades which consume bleaching materials.

NEVER SAY the public doesn't appreciate true art. There at the Chemical Show was Ivan Petrovich (some abominable realist has said that his name was Lutz. It shouldn't be) working a potter's wheel at the General Ceramics Co. booth and the crowd watched him with much interest. He would turn out a beautiful pot all ready for baking, and then crumble it up into a shapeless mass and make clay of it again. That is really the essence of true art, to create a beautiful thing and then to smash it. You have satisfied the creative impulse, and you have not bartered your soul to mammon in doing it. Anyway, it was fun to watch him, and his name might not have been Ivan Petrovich, but it must have been something which was not Kelly or Lutz. Incidentally, it was interesting to see the unbaked clay from which good pottery, acid-proof stoneware, is made.

HEAVY CHEMICAL MANUFACTURERS were quite noticeable by their absence, and it was with immense relief that one observed the Merrimac Chemical Co. booth, for it was one of the few evidences at the show that America had not gone out of the heavy chemical business. One unique feature of the Merrimac booth was the miniature containers, exact replicas of the life-sized barrels and drums and carboys which the Merrimac sends out, with the colors painted on and the lettering exactly as it occurs in commerce.

MANY'S THE TIME we have wanted to do some experiments at home, but have been restrained by fear of the wrath which descends upon those unlucky enough to get acid on the bathroom floor, or foolish enough to store cultures in the refrigerator next to the baby's milk. So that the sight of the neatest little table built by the Kewaunee Manufacturing Co. for a private laboratory filled us with the sudden desire to order one for the library. It looks more like a desk than a workbench, the brass connections for gas, water and electricity being not at all conspicuous. The stone top has a combination sink and basin built into it at one end. A microscope cupboard on one side, deep drawers at the other to hold reagents and supplies, and a shallow drawer across the top for miscellanea would appear to be adequate for nearly every demand.

CHEMISTS should not object to the synthetic orange drink served here and there, especially when adulterated with a scraping of rind. But a metallurgist would acknowledge that it is a good deal like circus lemonade —cold but not a quencher.

MEN AND WOMEN would rather "make believe" than do anything else. Children dress up in grown-up clothes and play house. Even Mr. Bryan, knight errant against all frauds, has bought a toupee. And the rest of us like to put on a good appearance, even in our work.

We always relished the thought of the early land surveyors on the Western plains. The pretty maps which they filed in the Land Office show that they carefully measured, with transit and tape, all the borders of the sections and townships and planted the corners into the ground according to law. But they didn't, they were frauds; they climbed into a wagon, drove along, and every now and then kicked out a stone. It must have been fun!

Once we saw some other frauds. They were traveling up and down the country roads in a Ford, in an aimless sort of way, like people who had no place to go and had lost their way. But they weren't. In the back of the machine they had a little box, and in it some glassware, by which they could analyze the air for one or two parts per million of SO_2—about a tenth of a smell!

Now the dairymen and creameries must be on the lookout for a smooth actor. He will come along with

a natty leather suitcase, which he got from the Central Scientific Co. He will look like a college chap asking his way to the railway station. But the suitcase doesn't contain socks; all packed away in the cosiest sort of manner is lamp, beaker, test tubes, slides and all the paraphernalia of Frost's field outfit for counting bacteria in milk.

WE RAN ACROSS an old friend we hadn't seen since doughboy days and were quite surprised to find him still in pursuit of the dogs of war. "Buddy," he said as we passed the exhibit of the Mine Safety Appliance Co., "it was a durned good thing these scientific birds had 4 months and not 4 years to make those gas mask chokers we wore in France. Take a slant at that complicated contrivance over there! It looks like a cross between a gas mask, a moving picture machine and a Ford engine—and I'll bet it weighs 150 lb." Our exaggerating companion was apparently referring to the new Gibbs self-contained oxygen breathing apparatus and some of its highly efficient accessories. Automatic cooling systems for the canister, timing devices definitely controlled by inhalation and exhalation and absolute protection against CO are some of the refinements that have found their way into gas masks since some of us used them in Sunny France.

SOMETIMES a combination of circumstances or events or even well-known chemical engineering equipment will produce more or less startling results. Thus whoever hit upon the idea of running an endless conveyor belt over a rotary vacuum filter, compressing the cake into the belt and finally passing belt and cake into a chamber drier deserves credit for bringing together in a practical way two of our fundamental chemical engineering operations. Proctor & Schwartz of Philadelphia and the Filtration Engineers, Inc., of New York had a joint exhibit of just such an ingenious combination in their new continuous filter and drier. In operation it was shown to work somewhat as follows: The vacuum filter drum revolves in a slurry of the material to be filtered, which is deposited on a woven wire conveyor belt.

Rolls of the cake compressor squeeze out the excess moisture and a thin, continuous cake, firmly enmeshed in the belt, passes into the drying inclosure. There it is automatically hung in loops or festoons for drying by heated air. At the delivery end of the compartment the dried material is beaten loose from the belt and falls into a hopper, from which it is removed by a screw conveyor.

We have been told that installations have already been made for drying certain pottery clays and decolorizing carbons in this way and it would seem that this is merely the beginning of a broad field of usefulness.

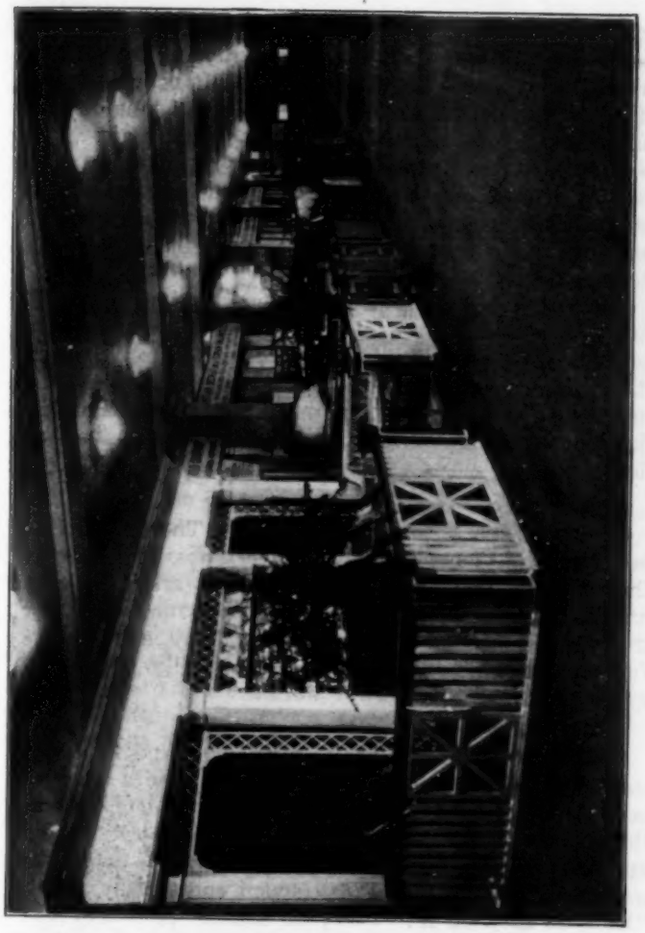
WHEN YOU ARE in the laboratory it is a comparatively simple job to make bleach liquor from chlorine gas. But when you are in a pulp or paper mill and want to make a 10,000-gal. batch in the same way you run up against a number of man-sized difficulties. Had you been at the Chemical Show, however, you might have found a solution for your problem in the two systems demonstrated there. The one shown by the Mathieson Alkali Works is brand new—in fact Mr. McMahon's patent was issued only Aug. 22, 1922. In it the operation is carried out by filling a concrete tank with just enough hydrated lime and water to react with the chlorine from a standard container (and it will be recalled that the Mathieson company has a decided preference for the 1-ton drum). The liquid chlorine is led from a pipe into an expansion coil within the tank. Here advantage is taken of the latent heat of vaporization of the liquid chlorine to counteract the heat developed by the reaction of the lime and chlorine. The gas from the coil is sucked into the pump that keeps the liquor in continuous circulation. After the chlorine in the container is exhausted, the clear bleach liquor is drawn off and the batch is completed.

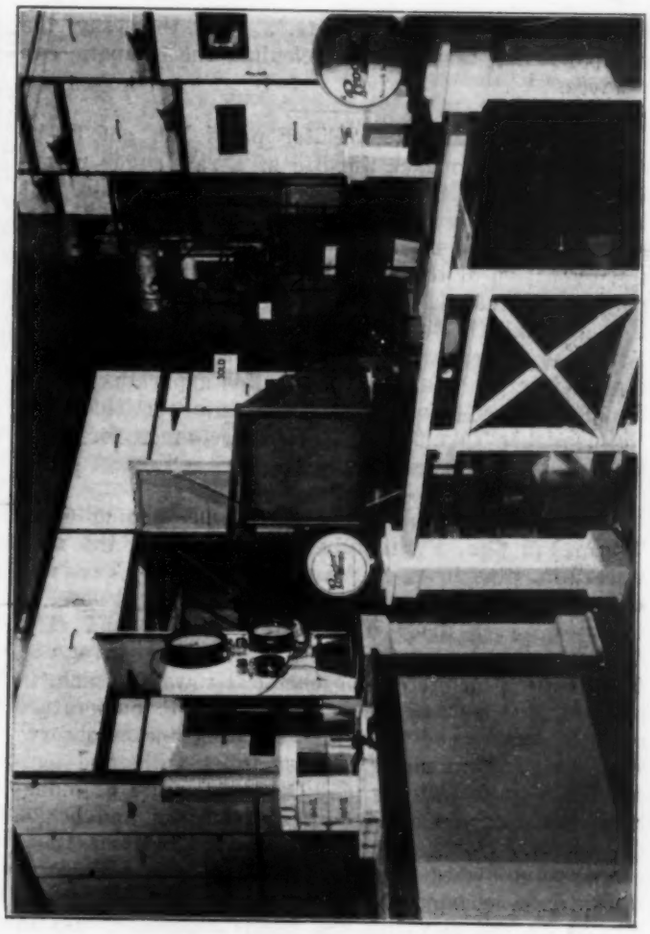
The older of the two systems is that of the Electro Bleaching Gas Co., which boasts of an operating installation as far back as 1919. Briefly, the system is made up of a circulation tank, a sludge tank, a centrifugal pump, an absorption tower and a storage tank. A measured quantity of lime and water is continually agitated in the tank and the solution pumped to the top of the stoneware absorption tower. The chlorine gas enters at the base of this tower, where countercurrents of gas and solution afford suitable conditions for the reaction.

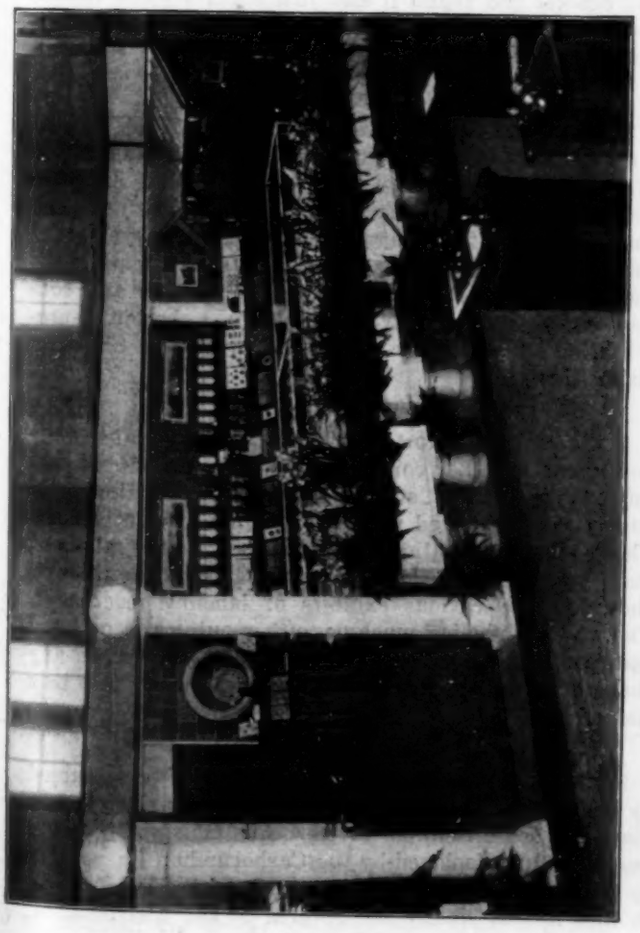
Circulation is continued until the desired strength of liquor is obtained or, if chlorine containers are used, until the supply is exhausted. If the chlorine comes in tank cars (and, you know, Electro Bleach likes to ship it that way), the gas is either measured through a flow meter or the strength of the liquor is determined by titration.

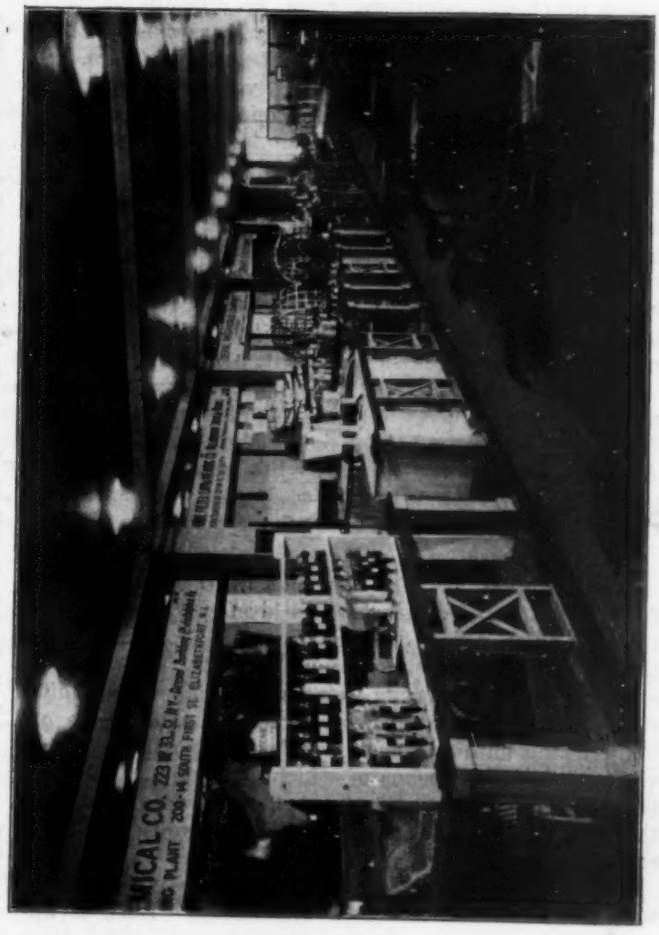
THE TEXAS GULF SULPHUR CO., besides its general exhibit and suggestions for new uses of its product, had one display with a story attached to it. Gulf sulphur is all at least 99½ per cent pure. But it all contains also from 0.002 to 0.5 per cent crude petroleum. Now, when sulphur is burned in a pan, this minute quantity of oil combines with the sulphur to form a very thin asphaltic film which puts out the fire. If one stirs it with a stick or if the sulphur is burned in a rotary kiln, the difficulty is overcome, but that does not satisfy the hop growers, prune producers, makers of other dried fruits, woolen manufacturers, bleachers of grains and others generally interested. Experience teaches that it is unprofitable to stir up burning sulphur with a stick in a closed room during a bleaching process, and rotary kilns are cumbersome. After a year's unsuccessful research in an endeavor to extract the oil or to provide a simple mechanical device to take the place of the convenient pans, it occurred to a gentleman connected with the company that, if the pans were lighted and set zigzag, one on top of the other, they might help one another along in combustion by the excess heat developed and thus overcome the film. Presto! It makes the sulphur boil, works completely (and the notion is patented).

THE ANACONDA CO. made an interesting display of hundreds of different forms of copper, zinc, lead and their alloys and compounds, not forgetting copper shingles in greens, browns and other shades. In addition to these tonnage metals, other rare ones like tellurium and selenium are recovered. Although they exist in the ores in almost indistinguishable traces, some is recovered. It's an everyday application of the rather foolish mathematical truth that zero times infinity may be finite. The company has sold over a ton of tellurium for radio detectors alone. When we consider the small fraction of a gram in each detector, we get a notion of how many people are listening in to









the broadcast "entertainments." And they say the glass industry takes all the selenium the company can produce.

THE CONTINUAL CRY, "Filter press has got to be cleaned!" which makes the life of a raw sugar manufacturer miserable, may not be heard, ever again. At least not if Messrs. Petree and Dow succeed in disposing of enough of their "cane juice clarifiers." This is a modification of the Dow tray thickener and the company claims that $2 legal currency per ton can be saved if you install this apparatus in place of filter presses. They like to deal with people from Missouri. A good deal of interest was developed in this apparatus and in the booth itself—for many lady visitors mistook the white wicker furniture and pink cretonnes for some kind of a nursery exhibit.

THE FENCE around the booth of the Corning Glass Works had 6-in. Pyrex tubes for posts and the rails were 3-in. pipe lines of the same material. This was but a little of the outside evidence of the recent development of Pyrex glass in industrial shapes and sizes suited to the needs of the chemical manufacturer. A 12-in. tubing is offered for chemical towers, which, in addition to its resistance to acids and temperature changes, has the advantage of enabling one to observe what is going on inside. These tubes withstand temperatures up to 600 deg. C. Other examples of industrial ware include 3- to 6-in. socket pipes and bends, distillation retorts containing up to 12 liters, 18-in. evaporating dishes, carboys, cylinders, etc. Within 6 weeks it is reported that 25-in. dishes holding 10 gal. will be on the market. "S" bends capable of use in many practical operations, such as cooling hot acid gases and liquids, in acid-condensing systems and for conveying hot liquids from condensers to receivers, are already being manufactured in various bores and lengths. One that has proved popular in distillation sets has an inside diameter of 2 in. and is 72 in. long.

But speaking of some of the domestic utilities of Pyrex, an unexpected convenience is to be found in an infant's nursing bottle which may be sterilized with boiling water without danger of breakage. Ardent testimonials from fathers with legs sensitive to the cold have followed the decreased time factor in preparing baby's meal on a freezing night when baby has announced his readiness to receive it.

In closing this little squib we are forced to add a plaintive note of despair. The remains of our beautiful Pyrex cigarette holder now repose in the gutter. Alas, its brief journey through life was suddenly and painfully interrupted by an accidental collision with the cement sidewalk!

AIR CONDITIONING, for the good of the product and for the health and comfort of the workers, has been the topic of much recent discussion. So it is natural that the Chemical Exposition should have its full quota of exhibits of conditioning apparatus. These exhibits ranged from the simple apparatus capable only of humidifying an atmosphere deficient in moisture to the elaborate units by means of which absolute control may be maintained over moisture and temperature within the building walls, regardless of the condition of the entering air.

Among other exhibits of this type the writer's eye was caught by the Bahnson Humidifier. Here is an extremely simple piece of apparatus—the principal part being an ordinary electric motor driving something which looked like a turbine impellor. It provides positive air circulation and will increase the humidity to any desired point above that of the entering air. And this without the aid of any auxiliary apparatus. The control depends on the moisture content of the atmosphere in the room which is being humidified, is positive and gradual in action and can be set to operate at any desired degree of saturation.

To go to the other pole of air conditioning, the B. F. Sturtevant Co. and the W. L. Fleisher Co. exhibited a complete, self-contained and compact unit for air conditioning, including refrigerating coils by which any temperature of entering air and any degree of humidification or dehumidification could be maintained as desired.

WHAT SHALL WE MEASURE NEXT? There seems to be a recording meter for almost every possible property that any possible form of matter could attain. There have lately been rumors of a recorder for measuring the specific gravity of liquids and, sure enough, we found it prominently exhibited by the Bailey Meter Co. at the show.

EVERY SHOW must have its mystery. And from the comments of the crowd, I should say that a goldfish bowl in the booth of Elyria Enameled Products Co. was the enigma of the year. People saw the bowl resting upside down on a nice blue-enameled surface—while the water stayed in and the fish swam contentedly about. "How do they do it?" everyone asked. And they felt the enamel and found it had just enough wavy feel to make the thing seem improbable, to say the least. Anyway, it was a nice piece of enamel!

IT HAS ALWAYS BEEN a pet theory of the present writer that the control of the generation and application of power in the average plant of a chemical or allied industry must be in charge of the plant engineer and that that plant engineer would be, nine times out of ten, a chemical engineer. This view is also, apparently, the view of the makers of power generating and control equipment. Every year shows a better representation of this class of apparatus at the Chemical Exposition.

SUCH AN OPERATION as the placing of a label on a bottle, can or other container may not seem of marked importance, but a surprising amount of time and money can be wasted where this is not efficiently done. That such considerations are uppermost in the minds of many just now was clearly demonstrated by the interest shown in the various exhibits of labeling machinery. The modern labeling machine, either automatic or hand operated, can place practically any kind of label on any shape of container, from a wooden packing box to a tiny vial of perfume.

SURPRISING AND NOVEL RESULTS are often obtained by the simple expedient of reversing the principle employed in some familiar device. At first sight the long boxlike affair displayed by the Carborundum Co. seemed to bear little relation to other parts of the exhibit, but in fact it was simply the reverse of the carborundum

muffle shown in another corner. Build a muffle of carborundum plates with a horizontal baffle, burn fuel—oil, gas or powdered coal—inside of this and you have the Cannon radiating furnace. The high thermal conductivity of the wall material favors rapid radiation of the heat, forming an ideal heating unit for many purposes. When applied to boilers it is claimed by the makers that an efficiency of 7 b.hp. per cu.ft. of combustion space is obtained.

SEVERAL BOOTHS were occupied by chemical societies and organizations of various kinds. Most of them were furnished with comfortable chairs, and were intended for meeting places and lounges. The "baby" of them all, the Technical Photographic and Microscopical Society, endeavored to show how photography is being used by industry. Its exhibits overflowed the railing. Hundreds of fine prints were mounted on the assembly room halls—ranging all the way from aërial mosaics taken 10,000 ft. high to glimpses of organisms observable only at 1,000 diameters.

To a metallurgist or a metallographist, by far the most striking was a series of micrographs of aluminum alloys, made at McCook field by the Army Air Service. Aluminum is notoriously difficult to polish and etch, so much so that early investigators thought the metal unique in possessing no crystalline structure. Yet here are views at 500 diameters, taken of polished surfaces, *unetched*, showing two or three constituents in the most minute detail and wonderful contrast!

EXTRAVAGANTLY DESIGNED DISPLAYS have been succeeded by more conventional efforts. Even the rainbow-hued color and dye exhibits were few in number. Perhaps the Bakelite Co. would have received the prize for colorful and artistic arrangement of its products, the brilliantly colored, amber-like materials being very effectively shown. The dazzling white of metal and lights at the New Jersey Zinc Co. and the brilliant reds and yellows at the Anaconda Copper Mining Co. gave natural tones which could be surpassed with difficulty. The United States Industrial Alcohol Co. had some purple hangings and royally carved furniture which contrasted strangely with the paper cartons of Alcorub which flanked them.

STATISTICS ARE INESCAPABLE, and when you saw the red light flashing at the National Lime Association booth and realized that every time it flashed a ton of lime had passed the way of all good things, you couldn't help sympathizing with the next ton of lime and holding your breath until the light went on again and you realized that it had also had its throat cut. The flashing light, however, did bring home to the visitors to the show the fundamental value of this commodity and its increasing importance. The National Lime Association is undertaking valuable work in enlarging our knowledge on this important commodity. Ample evidence of this work was apparent at the booth.

PROBABLY THERE WASN'T over a bushel basket of coke at the Koppers Co. exhibit, but many a longing eye was cast at that much fuel, and it would be interesting to know who finally got the stuff before it was transported from the Chemical Exposition. This company was exhibiting a revision of its design of coke oven, which looks promising. Instead of having the fuel burn at one end of the retorts and then exit from the flues to the regenerators at the other end (in other words, instead of having a lengthwise combustion of the fuel), the gases flow up on one side of retort and down on the other. This makes for much more even burning, and the quality of coke will be more uniform throughout the length of the burner. It is also reported that it is easier to regulate. The U. S. Steel Corporation has already decided to install these ovens at Clairton and at another one of its plants. It will be interesting to see whether the independent coke companies will take up with the new oven as enthusiastically as the proprietors of it.

MANY OF THE LARGER DYE MANUFACTURERS who have always taken space at the show were conspicuous by their absence this year. The Newport Company had a rather attractive booth, and dealers in dyes, such as Bachmeier & Co. and others, were represented.

Perhaps the most interesting booth was that of Zinsser & Co., who were presenting samples of alizarine colors on various fabrics. A number of hats were interesting in that they were among the first hats dyed with bottom chrome alizarines and marked a new era in hat dyeing. Some excellent woolen cloth from the famous Worumbo Mills dyed with brown and black alizarines indicated the use of these dyes on finer grades of woolens and worsteds. In addition, there were skeins of silk and printed goods of various kinds. There was also some worsted and woolen cloth for suiting, the origin of which was not revealed, but which was very satisfactory cloth. The successful distribution and use of these dyes make an optimistic note in the somewhat gloomy dye forecast. Here are colors which will compete with Germany on her most sacred ground of fine dyestuffs.

WE DOUBT if there is a chemical engineer in the country who has not at one time or another tried to dope out some way of measuring a quantity of water or other given liquids. They have struggled with the calculation of the V-notch meter and recording devices therefor. The Johns-Manville exhibit was, therefore, very interesting to them. This company has developed a meter which works on air pressure. The liquid fills up a cylinder on one side and is then discharged through a siphon while the liquid fills up its twin cylinder. Each time the cylinder discharges, a small cyclometer registers the fact that a unit volume has passed through the apparatus. The salesmen at the booth were either reticent or ignorant of the method of operation of the instrument, and no diagrams were available, but it was a very interesting advance and looks extremely promising.

LET US CONSIDER for a moment the case of an organic chemist with an idea the commercial development of which has been delayed only because of difficulty in obtaining the requisite quantities of a certain product—a compound answering to the name of furfural. At each exposition he has searched in vain for even a glimpse of the material which would mean success. Suddenly he stops in amazement, scarcely able to believe his own eyes, before a booth containing not simply a bottle of furfural but two standard drums!

So rapid has been the development of chemical industry that such an instance might be duplicated a dozen times.

Establishing a Rational Basis For Industrial Analyses

By Harrington Emerson
President, The Emerson Engineers, Inc.

The Elements of Production Are Equipment, Personnel and Materials—Analysis of the Costs Involved in Each Leads to a Rational Basis for Future Analyses—Method Illustrated From Statistics of U. S. Railroads

THERE are three elements in modern production, three partners with equal rights if not with equal interests. These three are like the three legs of a stool, which must be the same length, but need not be of the same thickness.

The three elements are:

The equipment.

The personnel.

The materials.

The function of each is different. The equipment does the work, the personnel supervises and directs the equipment which fashions and changes the materials.

These three are combined into a simple formula:

$$\text{Product} = \text{Equipment Costs} + \text{Personal Compensation} + \text{Materials Used}$$

Basic Example From Railroad Operation

In order to make the matter clearer, we shall illustrate all the steps, by using for the purpose, railroad operations.

Product, $1,000 of revenues, should be produced by equipment charges of $400 + compensation of $400 + materials $200.

The question immediately arises as to why $400 for equipment charges, why $400 for personal compensation and why $200 for materials?

To operate a railroad, there must be roadway, track and rolling equipment. These must come up to certain standards which the public and its representatives have grown to expect.

I have traveled on railroads where the only accommodation was an open flat car and where, under penalty of not arriving in time for dinner, the passengers had to cut wood for the locomotive. This would scarcely be tolerated anywhere in the United States.

It is demanded of a railroad that the transportation it furnishes shall be safe, convenient, frequent, rapid, punctual, comfortable and, lastly, decent. Each one of these requirements adds to the first cost of the equipment and also to the operating expense.

What Equipment Charges Comprise

If we examine the records of all the Class I railroads in the United States, about 200, we shall find that the investment in physical equipment is on the average $3,000 for each $1,000 of revenues. Some of the best roads have kept their investment down to about $2,000 for each $1,000 of revenues, but they are exceptions.

We can consider that $2,500 of investment in physical operating property for each $1,000 of revenues is conservative and that less than this would give rise to complaint.

The possession of equipment, even if it is not operating, causes various expenses that are in the long run inevitable, even if, for a short time, a few years, they can be deferred or be capitalized. The items making up the various expenses which perpetuate the property are only a few, as taxes, exactions, insurance, rentals, depreciation (the anticipation of future shrink), amortization (the making good of past shrink), unpaying betterments and, finally, the return on the investment.

These items are best expressed in the form of a percentage rate on the investment:

	Per Cent
Taxes	1.5
Exactions	1.0
Insurance, rentals	0.5
Depreciation	4.0
Amortization	1.0
Unpaying betterments	2.0
Return on investments	6.0
	16.0

Equipment Charges Increases as Property Ages

No one of these can be neglected, and a most disquieting fact is that the older the property the heavier are the charges.

At first taxes, exactions, depreciation and unpaying betterments are very low. Against a new railroad in a new country, all the charges might be as low as 8 per cent, but over the whole United States at the present time they average 16 per cent.

The normal, expected investment is $2,500, on which the perpetuation charges are at the rate of 16 per cent, or $400 out of a normal revenue of $1,000.

If the revenue is low in proportion to investment, either because rates are forced down or because investment has been made too large, the perpetuation expenses would amount to more than 40 per cent of the revenues, making this leg of the industrial stool too long.

The American railroad equipment perpetuation rate is 16 per cent, but amounted to $563 for each $1,000 of revenues in 1921.

Compensation's Share of Revenue

It is also stated that personal compensation can amount to $400. Why? After paying the perpetuation charges of $400, there is $600 left for operation. Part of this is for personal compensation and part for materials. How much for each?

The experience of the last 30 years in North America and in the United Kingdom shows that the material expenses are almost exactly one-half the personal compensation charges. This happens to be the railroad personal and material ratio and it is unchangeable, since material costs in the last analysis consist largely of personal costs. When personal compensation rises as it did during the war, materials also rise. When material costs drop, it is because personal costs have dropped. Therefore, of the $600 remaining out of $1,000 of revenues, $400 can be appropriated for personal compensation and $200 for materials to be used in operation and maintenance. Then $1,000 revenues

= $400 perpetuation + $400 compensation + $200 materials.

This is exceedingly simple, but usually not understood and not observed. Because personal compensation has to be met regularly and because material bills must also be paid promptly and because many of the equipment perpetuation costs can be deferred, be ignored, be charged to capital, the very vicious condition has arisen of paying more for personal compensation and for materials than the revenues justify. Two legs of the industrial stool, the compensation leg and the material leg, are too long. Sailors know enough to keep a ship on an even keel. She must not be down at the head or down at the stern, or show a bad list. Industrially, railroads are badly out of balance.

The figures, actual and standard are:

Actual: Revenues = $156 perpetuation + $563 compensation + $281 materials
Standard: Revenues = $400 perpetuation + $400 compensation + $200 materials

Whatever is added to compensation and to materials is at the expense of perpetuation. The roads have been living, and are living, on their own fat and some of them have already starved to death. If it is necessary to pay $563 for compensation, then without increasing the volume of business, it would be necessary to increase revenues to $1,400, an increase in ratio of 40 per cent.

The Universal Formula

The formula, however, as above given, is too simple and elementary. Each of the items—equipment charges, compensation and material—consists of two factors, the quantity factor and the quality factor.

The universal formula is written as follows:

$$\text{Product} = tR + TW + QP$$

in which tR stands for the equipment charges, TW for compensation and QP for materials.

t = hours in year that the equipment works.
R = rate per hour of all the equipment.

Analysis of Equipment Charges

Assume the total railroad valuation at $20,000,000,000; then with the perpetuation rate of 16 per cent, the total perpetuation charges are $3,200,000,000 = tR.

There are 8,760 hours in the year, and if the equipment worked every hour, the rate R per hour would be $365,000.

Unfortunately on the average railroad physical investment works only 5 per cent of the time, therefore 438 hours in the year. This boosts the rate R up to $7,300,000 an hour. We all know, of course, that a railroad cannot work all the time as a waterfall does, or a pipe line; nor nearly all the time, as paper mills and glass plants do, or as many mines do; but a railroad could improve very much. It could utilize its equipment two-thirds of the time, as some ocean steamers do. It uses some of its equipment, now, 25 per cent of the time, some 10 per cent of the time and a very large part of it only 2 per cent of the time. It would be quite possible at least to double the actual time-use of the equipment, not by increasing to 50 per cent the use of the few buildings and offices, but by increasing to 5 per cent time-use the enormously costly way and track.

The Question of Standards

This immediately brings up the question of standards. I can assume the railroad's full use of the hours of the year at 876, or 10 per cent of the whole time.

If this were done for the same volume of revenues, the equipment values could be reduced one-half, and instead of using $20,000,000,000 of equipment with an annual cost of $3,200,000,000 we should use $10,000,000,000 of equipment at an annual cost of $1,600,000,000 and an hourly rate of $1,827,500.

One-half the equipment working twice as many hours cuts the actual yearly cost in half and cuts the hourly rate to one-quarter. It means, were it possible, a yearly saving of $1,600,000,000.

It is of course not possible to reduce a horse to the size of a pony by starving him, even if he does travel only 5 miles a day. However big the horse, he must be fed, but in a new departure, I would invest in a pony and let him travel at least 10 miles.

The cost of a passenger train on the Kansas City, Mexico & Orient is about $2 a mile; an autobus in California carries as many passengers at a mile cost of 25 cents. The Kansas City, Mexico & Orient has an enormous and most idle investment in way, track and equipment; the California bus has no investment in way or road and a minimum investment in car.

We can now introduce standards with the formula:

$$\text{Actual: } t_a R_a = 438 \times \$7{,}300{,}000$$
$$\text{Standard: } t_s R_s = 876 \times \$1{,}827{,}500$$
$$\text{Efficiency: } \frac{t_s R_s}{t_a R_a} = 50 \text{ per cent}$$

It is evident that the best practice as to equipment is to use as little as possible, but to make it work all the time. The great world gain of using power-driven equipment is that it can work all the time, while man and animals can work only part of the time; but we have not yet outgrown the idea that, because man wants to rest two-thirds of the time, therefore the waterwheel should also rest two-thirds of the time, forever and irrecoverably wasting the unused water that goes over the dam instead of through the wheel.

Analysis of Personal Compensation

We next come to the leg of personal compensation.

On the railroads the amount available for personal compensation is $2,500,000,000 yearly. The two factors are: T, the total hours of all men, and W, the compensation rate per hour.

The actual average compensation rate per hour was $0.76. We can expect of each man 2,400 hours in the year; $2,500,000,000 at $0.76 will pay for 3,300,000,000 hours, and, giving each man 2,400 hours, it would be possible to employ 1,375,000 men.

B. M. Jewell, president of the railway department of the American Federation of Labor, is reported to have stated that the annual minimum wage for a railroad employee is $2,133, or $0.90 an hour. This establishes the quality of the worker. Divide the available compensation fund equally between all workers, it would be limited to 1,125,000 employees. The actual total is over 2,000,000. Each man now supervises $10,000 worth of equipment. Each man to be worth $2,133 should supervise $18,000 worth of equipment.

Actual: $T_a W_a$ = 4,900,000,000 hr. at $0.76 = $3,724,000,000
Standard: $T_s W_s$ = 2,778,000,000 hr. at $0.90 = $2,500,000,000

Efficiency and Compensation

In bridge building, piano wire costs more than cast iron, but it carries a greater weight for each dollar paid. The $0.90 an hour man must supervise more per

dollar paid him (the machine does the work) than the $0.60 an hour man or the $0.20 an hour man.

$$\text{Efficiency: } \frac{T_s W_s}{T_a W_a} = \frac{2,778}{4,900} \times \frac{90}{76} = 67 \text{ per cent}$$

If the revenues are right, then the efficiency of the workers is only 67 per cent. If the men are actually 100 per cent efficient, then the revenues should be increased 50 per cent.

Caught between the devil of low revenues imposed by the Interstate Commerce Commission and the deep sea of high yearly compensation demanded by the unions and more or less forced by the President, the railroad executive should curtail the non-essentials of service until he can perpetuate and operate within his revenues.

Safety need not be waived, but frequency, speed, punctuality and comfort could each be abated.

Analysis of Material Costs

The next item is materials—QP. Q is the number of units as tons of coal and P is the price per unit. The general law holds good for materials: The better the quality the lower the end cost, as a less quantity is used.

This is particularly true of coal. Coal with 40 per cent ash has two-thirds of the heat units of 10 per cent ash coal, but it has no steaming value and is worthless.

Materials cannot be aggregated into a single unit, as some are measured by the foot, others by the pound, others by the gallon. We can, therefore, give for materials only the total cost QP = $1,443,000,000.

In industrial plants the efficiency of materials of operation and maintenance is rarely over 60 per cent, but we can assume it at 67 per cent, the same efficiency as the compensation.

$$\text{Actual: } Q_a P_a = \$1,443,000,000$$
$$\text{Standard: } Q_s P_s = \$942,000,000$$
$$\frac{Q_s P_s}{Q_a P_a} = 67 \text{ per cent}$$

Effect of Equipment on Compensation and Materials

We have, however, not yet finished. The standard equipment is only one-half the actual equipment, and such standard equipment might on the whole require three-quarters of the men and four-fifths as much material. This would bring down compensation efficiency:

$$\frac{T_s W_s}{T_a W_a} = 67 \text{ per cent} \times 75 = 50.25$$

and material efficiency:

$$\frac{Q_s P_s}{Q_a P_a} = 67 \text{ per cent} \times 80 = 53.6 \text{ per cent}$$

Applying the Above to Industry in General

American industrial activities, almost without exception, are overequipped and undersupervised; too much equipment of poor quality, too many men of insufficient competence, too many low-grade materials.

A Ford costs more per pound than a locomotive, a chauffeur averages more than a railroad employee and gasoline costs much more than coal, but t is more, T is less and Q is less and the autobus operates at $0.25 a mile.

The summary of the whole can now be made in millions:

$$\frac{t_s R_s + T_s W_s + Q_s P_s}{t_a R_a + T_a W_a + Q_a P_a} = \frac{\$1,600 + \$1,996 + \$771}{\$3,200 + \$3,724 + \$1,443} = 52.2$$

Necessity of Getting the Elements of Industry in Hand

Until the big essentials are well in hand, until all three legs are of the same length, until each leg is of the best material, heat-treated, it is inept to puzzle about details. If the equipment is basically too heavy and too expensive, if the horse is too big, there is little gain in cutting down on his oats. If owing to imperfect planning and inadequate supervision, more men are on the payroll than the revenues justify, the difficulty is not remedied by holding a stop watch over the supervisor. Unless there are standards as to every item of material, efficiency checks accomplish but little.

I have used the railroads to illustrate the value of the formula as a means of analysis. The railroads are a very large business, intimately interwoven with all other industrial activities.

How This Formula Is Applied

The formula has been used to reduce the cost of the staples in a periodical, and it has also been used to show the aggregated condition of all the industries in the United States; it is a formula of universal application.

Columbus, with three little caravels and a few men and a few tons of stores, in 3 months' time discovered a new world. Everything was small except the personality of Columbus.

It is not far fetched to believe that the duty and destiny of man is, with greater and greater competence, during shorter and shorter hours, to supervise larger and better equipment working continuously, and to use materials to 100 per cent of their possibilities.

There has been a bitter struggle, wasteful, unscientific and unnecessary, between the railroad executives and the railroad shop employees. Compensation during the last few years has taken too large a proportion of the revenues. The employees, having made substantial gains in rates of pay per hour, in reduction of hours and in strenuousness of work during the war period, are very reluctant to go back to former conditions. Railroad executives, knowing that compensation must be reduced in volume, have erroneously supposed that the only way was to reduce hourly rates. The workers, learning of proposed reduction in total compensation, have erroneously supposed that this must mean either reductions per hour, longer hours per day or harder work. On account of these misconceptions the clash occurred.

By the use of demonstrated methods, unknown both to executives and to shopmen, it would be not only possible but comparatively easy to reduce total compensation 33 per cent, yet not discharge a single worker, not reduce any hourly rate, not require longer hours, nor the exaction of greater effort per hour. By adopting the proved out methods, by co-operating to make them a success, the executives could have attained what is imperatively needed, if railroads are to endure—a reduction in total compensation costs—and the shopmen could have retained what they won during the war—higher rates, shorter hours, lessened effort, all desirable if civilization is to progress.

New York City.

Adsorption a Criterion of Corrosion

BY B. D. SAKLATWALLA
General Superintendent, Vanadium Corporation of America

ONE of the most actively exploited fields of metallurgy today is the search after alloys, ferrous and non-ferrous, which will withstand corrosion. Experimenting has been practically the sole guide in this exploitation, and very many of the results achieved have been more or less accidental. We have known from times long gone by that certain alloys and metals have withstood corrosion for centuries, without our being able to attribute satisfactory reasons.

In our efforts to bring light into the subject and scientifically co-ordinate cause and effect, we have in recent years set up several theories as to the cause of corrosion. As such may be mentioned: the electrolytic, the film and the colloidal theories. Even with these at command, we do not seem to have made any great progress in understanding the phenomena. More so than the lack of understanding is the lack of a criterion or means of measurement of corrosion, which has hindered practical progress. Undoubtedly experimental investigation would be greatly accelerated and practical results more quickly achieved if such could be found, instead of relying upon actual service test as we are compiled to do at present.

It is remarkable that most of the so-called noble metals, especially of the platinum group, have the capability of taking up large volumes of gases. These gases are occluded not only in the pores of the metal in a loose condition, as in platinum sponge, but also are adsorbed on the surface and sometimes dissolved in the metal, forming a solution. It appears that the phenomenon of adsorption, whereby gases are condensed on the surface of a metal or of any other solid body, would have the tendency of imparting to that body surface activities, depending on the degree of adsorption. According to many investigators who have studied the phenomena of adsorption, it appears that every solid body in contact with a gas has the capability of condensing this gas on its surface. This condensation, in certain cases, reaches a magnitude corresponding to a pressure of several thousand atmospheres. Quincke advances the opinion that the film of adsorbed gas on the surface of a solid body shows a decreasing density, within the film, outward from the surface in contact with the solid body, and that at the surface of contact the density of the film corresponds to that of a solid body. Thus, the solid body will not be surrounded by the gas atmosphere in which it exists, but by a film of highly condensed gas constituting that atmosphere.

We are all aware of the fact that the velocity of a chemical reaction depends on the physical conditions of pressure, concentration, etc. The rate of interaction between the condensed gas of the film and the solid body will depend, therefore, on the density of the film. If a body has a high degree of adsorption, the condensation and consequent interaction velocity will be great and hence surface oxidation of the solid will take place quickly, probably instantaneously. We can thus see how a protective film will be formed immediately, which if it has the necessary physical qualifications of homogeneity, right thermal expansion, and so on, will prevent or slow up the velocity of further interaction. The presence of this reaction film will change the surface qualities of the body and hence its adsorption capability. However, if part of this protecting reaction film is removed by abrasion, the original metal surface with its adsorption capability comes again into play and instantaneously replaces the removed film. We have herein an explanation of the self-healing property of a protective film.

The corrodibility of a solid in a gas atmosphere will consequently depend on its capability of adsorbing this gas to a greater or less pressure, thus increasing or diminishing the velocity of surface interaction, hence being capable of instantaneously forming a protective film or not. Our experience in the past regarding metals such as platinum or palladium, which are non-corrosive and produce adsorbed surface gas films of a high degree of concentration, leads us to believe that the high interacting velocity and consequent nearly instantaneous production of the protective film is the essential factor in producing non-corrodibility. Hence the higher the adsorption capability the higher should be the non-corrodibility.

Another possibility of high degree of adsorption preventing corrosion is the fact that the high-pressure gas film, having the characteristics of a solid body, might act as protection itself without forming the secondary reaction protective film.

Owing to the high-density film being in contact with the solid another very important phenomenon may be brought into consideration—namely, diffusion. We might be able to explain on this basis how slight additions of another element to a metal, or difference in heat-treatment, or mechanical condition of the surface—i.e., whether strained or not—play a big part in accelerating or retarding corrosion. These influences might have a great bearing in changing not only the adsorption capability and consequently the rate of interaction chemically, but also of diffusion physically, between the solid and the condensed gas film. This rate of diffusion will undoubtedly have considerable bearing on promoting the speed of formation of the protective film.

As a remarkable example of the connection between adsorption and corrosion appears to be a fact mentioned by Dr. Balke in a recent address on tungsten and similar metals. He remarked that metallic tantalum was absolutely non-corrosive, having withstood the attack of boiling aqua regia for several hours, and at the same time mentioned the characteristic that it was capable of absorbing a very large volume of gas, thus being similar to palladium.

If the above contentions can be proved to be correct by experimental research, a definite relationship established between corrosion and adsorption, and an experimental method devised for measuring adsorption, we might have at command a simple and quick method of judging the adaptability of alloys and metals for corrosion. The method would be applicable as a criterion for atmospheric as well as submerged corrosion. It has been more or less firmly established that, for instance, in boiler water the dissolved gases are responsible for the corrosion and that by their removal corrosion can be checked. The study of submerged corrosion from the adsoption standpoint would therefore reduce itself to the study of the dissolved gases.

The above remarks are offered as a mere suggestion which may incite research in a new direction and may be of practical help toward solving the most imminent metallurgical problem now confronting us.

Pittsburgh Meeting, A.C.S., Section of Gas and Fuel Chemistry

EDITORIAL STAFF REPORT

THE Section of Gas and Fuel Chemistry of the American Chemical Society held its initial sessions at the Pittsburgh meeting with Dr. A. C. Fieldner of the Bureau of Mines as chairman and R. S. McBride, assistant editor of *Chemical & Metallurgical Engineering*, as secretary. The first session was a "Symposium on Combustion," under the chairmanship of Prof. R. T. Haslam, of Massachusetts Institute of Technology. Two other sessions were devoted to technical papers.

More than 300 persons were in attendance at the symposium as the Division of Industrial and Engineering Chemistry met with the Gas and Fuel group. The other sessions also developed a large number of worthwhile reports, as well as lively discussion, among the hundred or more persons in attendance. It was enthusiastically voted that the officers of the Society be asked to authorize the continuance of the Section for the New Haven meeting.

NEW KOPPERS OVEN DESCRIBED

The carbonization of coal was one of the most important general subjects considered in several of the papers. H. J. Rose described the new Becker coke oven, which has been developed by the Koppers Co., indicating the important increases in oven capacity which this new system of oven heating permits. As an example of the advance thus made it was reported that thirty-seven ovens of the new type will suffice to give the coke which would formerly have required fifty or more of the best previous type of ovens. This increase in speed of coking is the result of heating-flue construction. In the new oven the products of combustion of the heating gas pass over the top of the oven through cross-over flues and down the wall on the opposite side of the coal mass. Thus the horizontal heating flue, formerly the weakest structural feature of the oven, is greatly reduced in size.

The same author discussed the new electric oven method which has been developed at the Mellon Institute laboratories of the Koppers Co. for determining the byproduct yields which can be expected from any coal.

THERMAL EFFICIENCY OF A COKE OVEN

The thermal efficiency of modern regenerative coke ovens was discussed by Wilson, Forrest and Herty of the Massachusetts Institute of Technology staff, as a result of extended plant tests from which complete engineering data were obtained. There were included in this report: "First, discussion of data needed to show completely the thermal operation of a modern regenerator coke-oven battery; second, description of the experimental methods employed to obtain the needed data, together with a table giving experimental figures obtained; third, a table balancing total heat input against total heat output is given, with a discussion of this and a calculation of the efficiency of the ovens; fourth, a so-called sensible heat balance is tabulated, the net heat effect of the coking process is discussed and the relation between the sensible heat balance and the exothermicity of the conversion from coal to coke is indicated."

The authors conclude that the reactions involved in coking are exothermic to the extent of approximately 450 B.t.u. per pound of coal for the sample treated.

COAL CONSTITUTION AND ITS SIGNIFICANCE

A group of five papers by S. W. Parr, T. E. Layng and their assistants at the University of Illinois presented various phases of the problem of determining the constitution of coal and the relation of coal constitution to carbonization and to combustion of stored fuel. A study of solvents for the separation of coal into its type constituents has been made, with particular reference to the use of benzene, toluene and xylene. The investigators show that pyridine or acid solvents tend to react with the coal substance and do not give true indication of the constitution of the coal substance. Of the three neutral solvents, xylene gives the best and most complete removal of the bituminic material from the cellulosic material. The significance of these two groups of constituents is very effectively set out in the other papers.

During storage of coal there is no loss in the total B.t.u. of the fuel, but only a slight increase in B.t.u. per pound corresponding to the increase in weight which results from the absorption of oxygen. Mid-continent coals particularly have a large absorptive capacity for oxygen. As a consequence when the coal is burned in a furnace the oxygen is present intimately associated with the coal and goes off as carbon dioxide. This gas gives a blanketing effect over the fuel bed which deadens the fire and is the cause of the loss in efficiency and the practical plant troubles which follow the burning of mid-continent coal which has been a long time in storage.

By fractional decomposition these investigators have produced valuable data as to the behavior of the different constituents in the fuel. They have been able to carbonize separately the two groups of constituents and each of them when saturated with oxygen. For purposes of discussion the two groups of constituents are called bituminic and cellulosic. When these two constituents hold as much oxygen as they will combine with or absorb at low temperatures, they are spoken of as "oxygen saturated."

NEW THEORY OF COAL CARBONIZATION

From results upon these constituents the investigators propose a new theory of coal carbonization. Evidence shows that the bituminic bodies can often be oxygen saturated without destroying the utility of this constituent to bond the carbonized product into a good coke. It is this bituminic material which makes the coke coherent and gives rise to the cell structure. However, it appears that if the cellulosic material is oxygen saturated under many circumstances, the coking property is destroyed, even though a bituminic material of high bonding power be used. The evidence thus far available indicates a close co-ordination between experimental results and the practical experience with coals of different types. The authors conclude that the production of coke is not a simple matter of decomposition of organic matter. It is rather a destructive decomposition accompanied by cross-reactions which are largely affected by the oxygen content of the cellulosic group of constituents and to a lesser extent by the oxygen content of the bituminic group. The physical character of the final product depends upon the influence of the oxygen content more than any other single factor.

Parr and Layng, with assistants, reported on a

method for determining the softening point of coal, which consisted of heating the material in a tube while passing through it a stream of inert gas. When the coal softens, the particles of finely divided material coalesce and interrupt the flow of gas through the mass, evidenced by an increase in pressure at the inlet. When the heating has progressed further, the softened material loses its plastic form, becomes coked and is again porous to gas. By the time coking is complete the pressure required on the gas stream reaches a minimum again.

The application of this method to various types of coals gives a significant, distinctive set of results for each type. The authors indicate in this preliminary report that they hope to be able to distinguish between types of coals, the behavior of the types in storage, the behavior during coking, and to prophesy the relative value for coking from these characteristics of the raw fuels.

Products of Low-Temperature Carbonization

The coke produced from low-temperature carbonization of coal has in general been unsuited to general use because it is soft and subject to spontaneous combustion, making its storage and handling impracticable. Harry A. Curtis, of the International Coal Products Co., reported upon the Carbocoal process used by that concern for utilizing the coke produced by low-temperature methods. In this process, which has previously been described in *Chem. & Met.*, low-temperature coke is ground, briquetted after blending with pitch, and the briquets carbonized until a low percentage volatile product is obtained. The result is a dense, strong briquet which can be handled and burned almost exactly like anthracite.

In the report by Dr. Curtis are given the results of boiler tests of the unbriquetted low-temperature char, known in this process as semi-Carbocoal. These results show that attempts to burn this semi-coke on a Coxe stoker are impractical unless further prepared. The percentage efficiency obtained is rather low and the percentage capacity obtained from the furnace is not quite equal to that usually demanded in commercial practice. The heat absorption in the two cases reported is 59 and 63 per cent respectively, and the capacities obtained were 153 and 205 per cent of the rating.

Use of the low-temperature coke in powdered form in powdered fuel equipment gave slightly greater plant capacity and distinctly higher thermal efficiency, but the fuel is somewhat difficult to pulverize, so that it does not promise to be as widely useful in this form as when briquetted.

The methods used for examination of low-temperature coal tars were described by Prof. J. J. Morgan and R. P. Soule of Columbia University. The methods given were those given in articles which have already been reported by *Chem. & Met.*

Study of Coke Structure and of Sulphur in Coke

The character of coke as judged by its macrostructure is of great importance in valuing this material. A paper was given by H. J. Rose describing a system of impregnating the cut surface of a coke sample with a mixture of plaster of paris and magnesia in order that the delicate detail of structure can be brought out. Another novel method proposed is the direct ink printing from polished coke surfaces properly sectioned.

Physicochemical studies of the forms of sulphur in coke indicate, according to the report of A. R. Powell of the Bureau of Mines, that the sulphur exists in two distinctive forms: (1) a stable form which exhibits all the properties of a solid solution, and (2) free sulphur physically absorbed by the carbon. Coke may contain both of these forms in addition to some sulphur combined with iron as ferrous sulphide. At temperatures about 500 deg. C. the ferrous sulphide of coke oxidizes very readily in the presence of air to ferric oxide and free sulphur. This reaction seems to occur during the quenching of coke and explains the disappearance of ferrous sulphide from coke rather than any reaction which occurs during the coking process.

Discussion of Powell's work developed the suggestion that the same general scheme might perhaps be applied to nitrogen in coal and coke to gain an insight into the reactions that render it available as ammonia during coking.

Producer Gas From Powdered Coal

The making of producer gas from powdered coal in order to achieve higher over-all efficiencies from fuel use was discussed by R. T. Haslam and L. Harris of the Massachusetts Institute of Technology. Aside from the possibility of using a low-grade fuel, the use of powdered coal for the manufacture of producer gas would give a constant composition gas free from tar, thus being easily cleaned, and the producer would be flexible, rapidly handling changes in load up to full capacity. As a result of experimental work not yet completed a gas of 12 per cent CO and 7 per cent CO_2 has been generated. Theoretical and experimental considerations show that the main factors are, first, high temperature in the combustion chamber (1,100 to 1,300 deg. C.); second, air for combustion highly preheated (900 to 1,000 deg. C.); third, coal finely pulverized, and fourth, air and coal well mixed together and so maintained until the end of the reaction.

Gases in Brittle Boiler Plate

Steel samples from two boilers which had failed from caustic embrittlement have been analyzed by the Bureau of Standards. One boiler was several years old, the other comparatively new. Analyses for gases were made on samples representing the material from the center of the plate where no cracks had developed and from the edge of the plate between rivet holes where cracks had developed. There was but little variation between the combined nitrogen content of the center and the edge of the same plate or between the different plates.

The results for oxygen and hydrogen by the vacuum fusion method with antimony-tin alloy indicated 0.02 to 0.03 per cent oxygen and 0.0020 to 0.0030 per cent hydrogen in the plate.

Whiteware Studies in Pacific Northwest

The United States Bureau of Mines, in co-operation with the University of Washington, will undertake an investigation of the residual kaolins and feldspars of eastern Washington and northwestern Idaho for whiteware bodies.

The work which will be done will follow the lines of the kaolin investigations now under way at the ceramic experiment station at Columbus, Ohio, and will be performed in the new mines laboratory of the University of Washington at Seattle.

Graphitization in a Carbon Tool Steel

By Henry S. Rawdon and Samuel Epstein
Physicist and Associate Physicist, Bureau of Standards

In A recent article in this journal[1] a peculiar type of black fracture occasionally occurring in annealed carbon tool steel bars was described. Although the examination appeared to have been rather complete, no definite conclusion could be reached by the author as to the fundamental nature of the phenomenon or as to the reason for its occurrence. Advantage was taken of the offer to furnish a specimen for study, and the results of the examination of the specimen obtained in this way constitute the present article.

The sample was a short section of a 1⅛-in. bar; its fracture showed the same characteristic features as those previously illustrated in Fig. 1 of Mr. Green's article. In what follows, the light-colored muff will be called zone *a*, the black interior, *b*, and the light-colored pencil of material at the axis, zone *c*. The pronounced difference in structure existing across the section of bar was evident even in the rough-sawed face.

Microstructure

Fig. 1 is a micrograph illustrating the appearance of the material, "as received" polished but unetched. In each of the three zones isolated black spots were found; in zones *a* and *c*, which are very similar in appearance, the number of these was very much less than in zone *b*. In this one, the spots were arranged in a manner very suggestive of the crystalline structure of the metal.

The structure of the specimen as revealed by etching is shown in Fig. 2. Zones *a* and *c*, which appeared to be essentially identical, consisted of a ferrite matrix imbedded in which were numerous granules of spheroidized cementite together with the irregular black spots previously referred to. Zone *b* appeared to be practically free from cementite, either pearlitic or spheroidized, and showed only a ferrite matrix in which was the network of black patches noted in the unetched state. Presumably these black spots are graphite; they have the appearance of "temper" graphite such as results upon annealing rather than the flaky variety which separates directly from the alloy when in the molten state.

Heat-Treatment

The specimen was first given a "mild" hardening treatment: water quenched from 740 deg. C. (1,365 deg. F.), which is just above the beginning of the Ac transformation (according to Mr. Green's curves). It was put into the hot furnace, brought up to the desired temperature and held for approximately 5 minutes. After examination, the sample was given a more severe treatment: water quenched after being held for one hour at 775 deg. C. (1,427 deg. F.), which is considerably above the end of the Ac transformation.

TABLE I—BRINELL HARDNESS (⅛-IN. BALL, 15 KG. LOAD)

Treatment	Zone *a**		Zone *b**		Zone *c**	
Initial state	102	globular cementite and ferrite	67	graphite and ferrite	102	globular cementite and ferrite
First hardening (740° C.; 5 min.)	477	martensite and cementite	138	graphite, martensite and ferrite	225	troostite and globular cementite
Second hardening, (775° C.; 1 hour)	515	martensite	467	martensite and graphite	510	martensite
Annealed (775° C.; furnace-cooled)	120	pearlite and globular cementite	108	pearlite and graphite	127	pearlite and globular cementite

* In addition to the micro-constituents given, *a* and *c* also contained small amounts of graphite throughout.

In each case the outer light-colored layer, zone *a*, showed a martensitic structure. After the first or "mild" hardening treatment, a considerable amount of globular cementite remained scattered throughout the martensitic matrix (see Fig. 4). After the second quenching (Fig. 6), almost all of this had been dissolved in the matrix, thus accounting for the slight gain in hardness noted in Table I.

In zone *b*, the portion corresponding to the mossy black fracture, the structure varied considerably according to the severity of the hardening treatment. In Fig. 3 this zone was only partly hardened, each black (graphite?) spot acted as a center for the formation of martensite. Evidently these spots were the source of the carbon which dissolved in the ferrite matrix. The relatively low quenching temperature used and the very short sojourn at this temperature prevented complete diffusion of the dissolved carbon in the ferrite so that, in the quenched sample, portions of the unaffected ferrite matrix were still to be seen between the martensitic patches surrounding the black spots. This structural condition should properly be regarded as one of the transition stages through which the specimen, upon receiving the more severe treatment, passed. In this latter case (Fig. 5) no ferrite was found, the solution of carbon was uniform throughout the entire zone. It will be noted, however, that the black spots did not entirely disappear, but remained as a conspicuous feature of the microstructure.

Zone *c*, being at the center of the specimen, was not hardened completely by the mild quenching. This portion showed a troostitic structure and, as indicated in Table I, was much softer than the martensitic condition which resulted in this zone after the second or *severe* hardening treatment. Traces of graphite were found in the martensitic matrix of both zone *a* and *c* after both hardening treatments. These correspond to the isolated spots in these zones in the initial state of the material.

[1] Arthur W. F. Green, "Black Fractures in Carbon Tool Steel," *Chem. & Met. Eng.*, Aug. 9, 1922, p. 265.

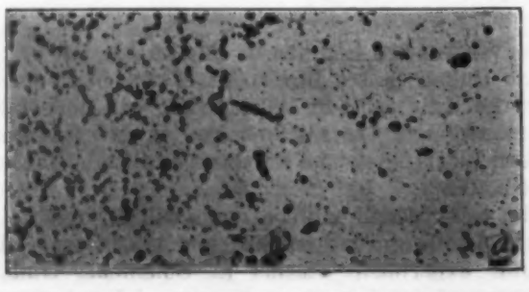


FIG. 1—UNETCHED SPECIMEN AT TRANSITION FROM BLACK TO LIGHT FRACTURE. × 100

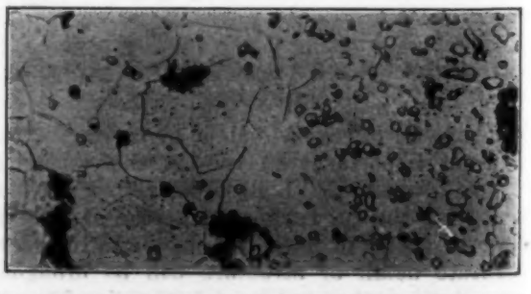
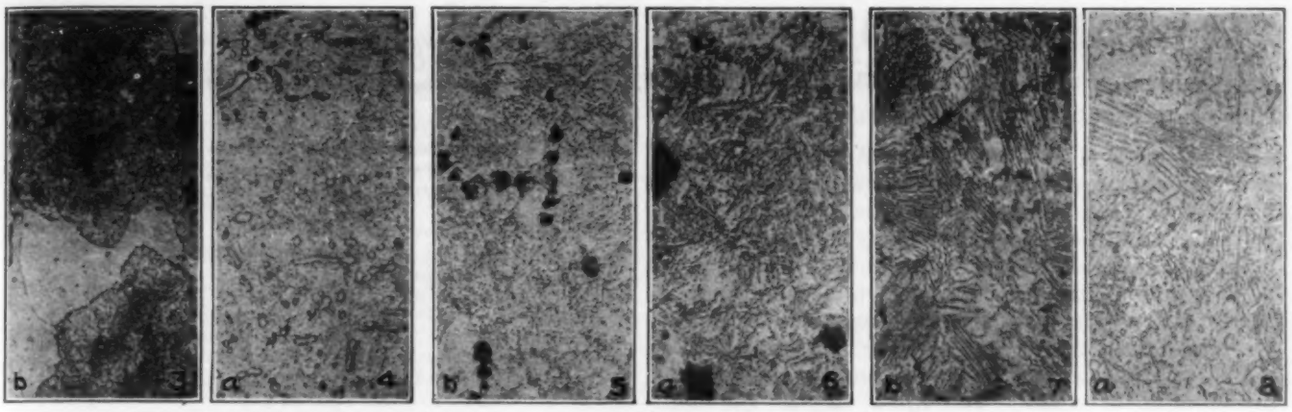


FIG. 2—SAME SPECIMEN AS FIG. 1, ETCHED WITH 5 PER CENT PICRIC ACID. × 500



FIGS. 3 TO 8—STRUCTURE AFTER VARIOUS HEAT-TREATMENTS. ETCHED WITH PICRIC ACID. × 500

Figs. 3 and 4—Black and light areas after mild hardening. Figs. 5 and 6—Black and light areas after full hardening. Figs. 7 and 8—Black and light areas after annealing.

The hardened specimen was then annealed at 775 deg. C. and furnace-cooled. The resulting structure of zones *b* and *a* are given in Figs. 7 and 8. A comparison with Fig. 1 shows to what extent the condition and distribution of the carbon were affected by the series of heat-treatments described. In addition to the black areas, still to be seen, zone *b* showed considerable pearlite which formed from the carbon which dissolved upon heating the specimen above the Ac transformation, instead of the initial structureless ferrite matrix. As might be expected, zones *a* and *c* also showed a considerable amount of pearlite after the series of treatments instead of being completely spheroidized as in the initial condition.

Chemical Composition

The specimen, after the heat-treatment was completed, was analyzed chemically, the sampling being carefully done so as to keep zones *a* and *b* separate. (The small amount of material available did not permit of an analysis being made to represent the initial state of the steel.) The results are summarized in Table II.

TABLE II—CHEMICAL COMPOSITION*

Specimen	Carbon — Total	Carbon — Graphite, Per Cent	Manganese, Per Cent	Sulphur, Per Cent	Silicon, Per Cent	Nickel, Per Cent
Zone *a*...	1.20	0.30	0.15	0.024	0.07	not detected
Zone *b*...	1.24	0.45	0.15	0.023	0.08	not detected

* Analysis by H. A. Bright, associate chemist, Bureau of Standards.

So far as should be judged from the microstructure of the material in its initial condition, the outer layer, or zone *a*, did not contain much more graphite than was found by analysis. In zone *b*, however, essentially all of the carbon was in the graphitic form in the initial state of the material. After being subjected to our series of heat-treatments, however, the analysis indicated that the greater portion had reverted to the combined form. The other results of the analysis summarized above indicate no other feature of composition which throws any light on the unusual behavior of this specimen.

Nitrogen in Steel

A method for determining total nitrogen in steel has been under investigaton by the Bureau of Standards. It depends on the absorption in calcium vapor of all the gases evolved from the steel sample when fused *in vacuo*. The nitrogen is fixed as calcium nitride, which is then readily determined by solution in acid and distillation with sodium hydroxide.

Acetone as a Solvent for Bitumens, Asphalts, Animal and Vegetable Oils

An extensive investigation of the solvent properties of acetone is being conducted at the Mellon Institute of Industrial Research of the University of Pittsburgh, in order to ascertain its value as a commercial solvent. In the course of the work a number of bitumens and of natural and artificial asphalts have been tested. From the data obtained it has been concluded that the percentage of acetone soluble material decreases as the hardness of the asphalt or bitumen increases; it also decreases with the time of blowing, in the case of mineral rubbers. It was further noted that acetone possesses higher solvent properties for wood-tar pitch than various other commercial solvents. These conclusions, however, merely corroborate statements made by other investigators.

The acetone used in this investigation was obtained by the destructive distillation of calcium acetate and was of excellent homogeneity and uniformity. Its low specific gravity lowers its cost below or equal to other commercial solvents of high specific gravity, when purchased by the pound. Acetone is miscible with all ordinary commercial solvents and possesses the property of forming a homogeneous solution when added to two immiscible solvents.

A number of commercial and refined vegetable and animal oils have been tested and found miscible in all proportions with acetone at 25 deg. C. A small percentage of insoluble material was found in a few of the crude products, due, no doubt, to some foreign matter. The part soluble in these cases at 25 deg. C. is miscible in all proportions with acetone. The heavy greases and hydrogenated oils are only partly soluble at 25 deg. C., but are miscible in all proportions with acetone at its boiling point. A number of essential oils have also been tested and found miscible in all proportions.

The present grade of acetone obtained from calcium acetate is entirely volatile and therefore does not leave a residue in or impart an odor to the extract or extracted material. Its low boiling point permits the carrying out of extractions without danger of chemical changes in the product. Acetone is miscible in all proportions with and has a great affinity for water and thus acts as an excellent dehydrating agent. Acetone is less flammable than benzene, toluene, ethyl ether, gasoline, petroleum ether or pentane. Its physiological effects are negligible, if ordinary care is used in handling the solvent.

"You Know Me, Al Uminum"

As Presented at the Smoker of the American Chemical Society at Pittsburgh

AT EVERY MEETING of the American Chemical Society the local entertainment committee prepares "stunts" to be given at the smoker, when all dignity is relaxed and everyone becomes a boy again for the evening. The sixty-fourth meeting in Pittsburgh was no exception and that the efforts of the committee were appreciated was evident from the congratulations they received during the remaining days of the meeting.

One of the most amusing of the stunts was the presentation of a skit "You Know Me, Al Uminum," presented by the New Kensington Laboratory, Aluminum Company of America, written by H. V. Churchill. It is here presented in its entirety.

You Know Me, Al Uminum

Cast of Characters

AL UMINUM (A brilliant lightweight)....W. I. Sivitz
SILLY CON (A hard character).....E. L. McMahon
HYDRO GEN (A lady of volatile temperament) .....Emma Svenson
OXY GEN (A cosmopolite who loves 'em all).....Roberta Bridges

PROLOGUE

When Laugmuir writes for the learned *Journal*
Of concentric rings with an inner kernel,
He's miles ahead of the common herd;
The rank and file don't grasp the word.

So Ellwood Hendrick for *Chem. & Met.*
Sought to explain, but even yet
Lingers the question, persists the doubt,
If even Hendrick knew what 'twas about.

Our colloid friend from old Cornell
May know, but time alone will tell
If even dear wise Wilder D.
Does comprehend this theory.

Hildebrand of the Sunkist State
May understand, but it is fate
That gives him valiant aid;
Lewis tells him what was said.

William D. Harkins of isotope fame
Cou'd yet enrich his well-known name
If he by hint or demonstration
Would make quite plain this lucubration.

Bill Lloyd Evans of Ohio State
Might cease his oxidation
And lend his ever trenchant pen
To mend our education.

H. P. Cady of old K. U.
Might cease his deep research,
But H. P., like the rest of them,
Has left us in the lurch.

Herty's too busy with colors and dyes
To waft to our ears the wanted replies;
He's been too busy at work on the tariff;
There's really more than he can take care of.

The cosmic urge to relieve the strain,
To make it simple, to make it p'ain,
Is the sole excuse for our present act
To now make plain what the others lacked.

The elements both great and small
Are sentient beings we can call
To tell their stories of life and love
As clear and bright as the stars above.

Al Uminum, a brilliant scout,
Loves all flappers round about,
While Silly Con, his foolish friend,
Has love affairs that never mend.

Two sisters come to see these men,
Two sisters of the name of Gen:
Oxy, the vamp, with vivid hair;
Hydro, her sister, almost as fair.

As said above, the learned men
Have sought ere this to wield their pen
In explanation of what it is
That makes each element just as is.

But now the truth will come to light
That elements may live and fight
And love and move, improve their soul
And move to their eternal goal.

Scene: Beyond the Chemical Veil

The curtain rises disclosing AL

AL (*soliliquizing*): Ah me! For years I've served my time in the kitchen. But if the world expects me to be happy *wearever* I may be, and whatever I'm called upon to do, the world is wrong. But then I'm ambitious and long for better things. I trust that when my time for better things has come I will have the best. Yes, better a hub cap on a Lincoln than to rattle and shake in the frame of a "car" I cannot well *afford*.

Enter SILLY CON

SILLY CON: Ah, milord, many times have I mixed in your affairs, and it is true that in time to come I will mingle once again, for methinks I'm happier in your affairs than when subjected to the heats and tempers of a career with F. Eric Iron, where usually my hopes are blasted, or at least withered in the fierce heat of the crucible of living. But enough of hopes. I just met the Gen family, the two sisters Oxy and Hydro.

AL: But tell me, where are they?

SILLY CON: They will be down here to call soon. They got mixed up with a couple of live ones from the Bureau of Standards, but the Washington boys couldn't give them Civil Service, so they shook them.

AL: Silly, old chap—you know I can't make up my mind about those girls or even their sister Nitro. When I am with Nitro Gen I would have none but her, and then a caustic word or two and we are thrust apart. She gives me a most unstable feeling. At that I'm losing weight, I fear; up at Harvard they say I weigh only 27, while the Bureau of Mines has claimed that I weighed only 26.8, but those fellows aren't always right. They talked about Hydro Gen too, but then Hydro Gen is not so dense as they claimed; she's a clever girl, and certainly fooled them just as I did.

SILLY CON: I have nothing to do with Nitro Gen, but what thinkest thou of Hydro Gen?

AL: Well, it's hard to say; she's always sticking with Oxy, which makes things rather damp, and only the other day Hydro said to me that when I really warmed up I was a most absorbing chap, but when my ardor died I was not at all so attractive to her.

SILLY CON: Well, for me, I'll say Hydro is much more attractive than Nitro.

AL: But, O boy! Little Oxy, she's the kind that always sticks around. Hot or cold, once with me she sticks. That's why I hesitate. When I'm apart from her I'm fairly neutral, but she is such a feminist that if we really wed I'd have to change the gender of my name like Maggie Sulf's brother did.

SILLY CON: What! Does that loose character have a brother?

AL: Sure! Years ago her elder brother Magnes married Oxy Gen. They since have been divorced, but while still married old Magnes was known far and wide as Magnesia.

AL: Speaking of Oxy Gen reminds me of a bit of gossip that may interest you. You are familiar with the publication that is always printing scandal about the elements?

SILLY CON: Do you mean the publication that is always telling what great discoveries are being made at the Mellon Institute, such as Pittsburgh fog dispellers, and——?

AL: Oh, no! I know what you mean. You have reference to the New York *Journal* or the New Kensington *Dispatch*. Now let me think. *Chemical Abstracts?* No! That is Organically too Complex. I have it! It is a McGraw-Hill weekly—*Chem. & Met.* Well, anyway, the story goes that one night Oxy Gen met that crude, unrefined Pete Roleum, and off together they went.

(SILLY CON *expresses surprise and horror*)

AL (*continuing*): The next morning Oxy Gen claimed an alibi. She said that man, Dr. James up there, enticed her by using a catalyzer.

SILLY CON: Ha! Ha! Ha!

AL: I tell you, Silly Con, it is contact catalysis which makes these blue-eyed flappers of Broadway wild—all of which makes Bancroft wilder.

(A noise is heard without. Enter the two sisters.

A general greeting occurs.)

AL (*greeting girls*): I'm glad to see you. I miss your sister Nitro, but you know that girl ought to be careful. She should be taught to avoid the *Shoals* and beware the *Henry* or she will be fixed good and plenty.

SILLY CON: Al, you're lightweighted mentally as well as physically. Henry says he'll give Nitro Gen many a trip to the rural districts if Uncle Sam will give him the plants and a dam site more.

AL: Well, enough of Nitro. (*Turning to* HYDRO). And, Hydro, have you a rich auto maker to befriend you?

HYDRO: No, I'm pretty particular. Some auto makers I know of are not only interested in Nitro, but also in my cousin Hydro-Electric. Sort of Mormon-like, you know.

SILLY CON: Gee, Hydro Gen; you're easy to get up in the air.

OXY GEN: Isn't any one going to pay attention to me?

AL: Well, Oxy, old girl, we aren't neglecting you. But Silly and I are alike in one respect: You are so fascinating to both of us we are pretty cautious about too close contact. But that aside, Oxy, sing us some of that electron jazz stuff, but cut out that Brownian motion.

(OXY *sings*)

Al Uminum, with form so light,
Al Uminum, your face so bright;
Your valence three, while mine is two,
Your silv'ry grace makes me love you.

Al Uminum, I love you, I love you;
Each passing moment I'm longing for you,
You can't escape my caresses at all;
Your brilliant polish, your silv'ry finish,
With all my bonds I'll dull you, I'll dull you;
We cannot live apart, our love will live,
We have naught to forgive,
I love you, Al Uminum.

SILLY CON: By the way, Oxy, where is your brother?

OXY: Oh, you mean old Dry?

SILLY CON: Yes, old Dry Gin.

OXY: Why, he still has that old one on the brain. He's just full of that old Ethyl.

AL: Huh! Thought she was deported.

OXY: Technically yes, but practically no. She's quite elusive, you know, and she keeps slipping back. My goodness, Al, the names that girl goes under!

AL: I suppose I ought to be still about Ethyl, but after all I guess the Copper on this beat has the best reason to be still.

AL (*suddenly*): Oxy, I wonder if you'll let me whisper the old, old story once more; I don't care if we aren't alone.

OXY: Well, I suppose I'll have to get this over with.

AL: Oxy, I've tried both ways, with you and without you. In your presence I can't maintain my individuality.

OXY: Yes, I've heard that in my absence you were quite brilliant.

AL: And that isn't all. When I'm apart from you I am put to all sorts of tasks, in the kitchen, in the garage—I rather like that, though the engines are dirty—but when I am on those tasks I'm supposed to leave you strictly alone, and some way or other I realize when I am with you that I cannot exist without you. Oxy Gen, will you be mine?

OXY: Well, to tell the truth I'm not very coy, but if you will agree to share me with F. Eric Iron and old Silly Con, I will be yours in part.

AL: Sort of trial marriage, eh? Well, divorce is always possible, if things are not satisfactory. Maybe I'm giving up a lot, but I feel so isolated when I'm not with you. But, Oxy, I don't want to share you with others. You mention F. Eric Iron and dear old Silly Con, and truth to tell I've heard of others despite the fact we are natural affinities. If I alone can't have you, that settles it. Goodby.

OXY GEN: Oh, very well. It's all very well for you to talk that way, but mark my word, sooner or later I'll get you and have you for mine.

SILLY CON: Well, Oxy, I'm not so strait-laced as old Al. I'll just trot along and bask in your smiles as long as I can. No use sticking around, Hydro; you'd better trot along too.

OXY: Goodby, Al, old thing. Remember what I said. I've got old Silly, and I will get you yet.

AL (*slumps into chair*): What a common creature! She would tarnish whomever she would touch; even old F. Eric Iron has been looking rusty lately. However, life is that way. It is a Weidlein which keeps some of these elements from bringing home the Bacon. Oxy Gen seems to take old Al for a sucker, but that's the way with all Fishers. No matter how scientific they are or what the materials, they think old Al can be caught with the same bait used for F. Eric Iron or old Pete Roleum. Well, I wonder if Oxy is right. Will she finally get me? You know her list of victims is pretty long. But the solitary life for me, with just a few boon companions and not too much of them—old Copper, F. Eric Iron, Silly Con, Maggie Sulf's brother and a few others—but when old age comes creeping in and I am no longer on my mettle I will turn to Oxy Gen and yielding to her embrace cling fast till in some other phase I am reborn.

Properties and Manufacture of Aluminum-Silicon Alloys

By Junius David Edwards
Assistant Director of Research, Aluminum Company of America

SILICON is assuming importance as an alloying ingredient in aluminum. As a minor constituent, say in amounts of 1 per cent and less, it has always appeared as an impurity in aluminum alloys. As a major constituent in amounts up to about 15 per cent, it is capable of conferring very valuable properties upon aluminum alloys. Aluminum-silicon alloys have long been known, but their commercial development is comparatively recent.[1]

Aluminum-silicon alloys may be grouped in two classes. What may be called the "normal alloys" are made by melting silicon (or a rich alloy of silicon and aluminum) with aluminum, and casting in sand according to the usual foundry practice for aluminum alloys, except that in most cases all chills may be omitted. They are characterized by a relatively coarse crystalline fracture (Fig. 1), especially when the silicon is high. When

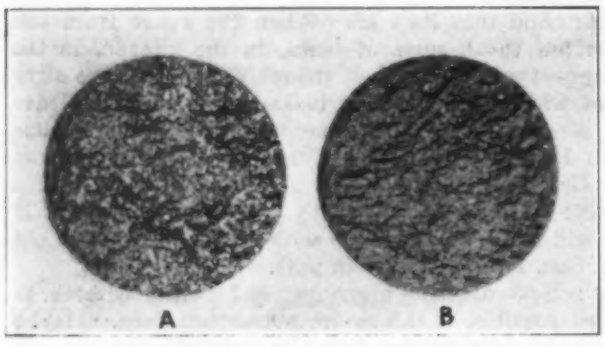


FIG. 1—ALUMINUM-SILICON ALLOY
(12.5 per cent silicon)
A—Shows relatively coarse crystalline fracture of unmodified alloy.
B—Shows very fine grained fracture of modified alloy.

the iron content is also high, excessively coarse-grained structures are produced. When polished and viewed under the microscope, they reveal the presence of silicon as relatively large plates and needles in a matrix of aluminum.

What are known as the "modified alloys" are given a special treatment in the molten state immediately before casting. The Aluminum Company of America's process[2] of modifying aluminum-silicon alloys consists in the addition of very small amounts of metallic sodium to the molten alloy a short time before casting. The modified alloy exhibits an exceedingly fine-grained fracture (Fig. 1); the microscope shows the silicon to be present as very finely dispersed particles;[1] the silicon particles are sometimes so small as to be resolvable with difficulty even at very high magnifications.

The modified alloy largely reverts to the normal alloy on remelting, so that to secure a completely modified alloy, the molten metal must usually be re-treated each time before casting.

The aluminum-silicon alloys possess a combination of desirable properties which fit them for many uses, especially for the production of difficult castings, involving both thick and thin sections. Some of their most useful characteristics fall under the term of "casting properties." They flow readily, may be cast into very thin sections without cracking, and are quite free from shrinks and the porosity which is not uncommon in some other aluminum alloys, so that they are "water-tight." These same good casting properties are found in both the normal and modified alloys, so that the use of the modified alloy is, in general, only indicated where its increased strength and ductility will prove advantageous. The proportion of silicon to be used in any alloy will depend on its particular application. In general, a somewhat higher proportion of silicon can be used in the modified alloy than in the normal alloy. This is due to the fact that the process of modification raises the apparent eutectic composition considerably above its normal figure (11.5 per cent silicon), and changes what would have been relatively large particles of excess silicon (in alloys containing over 11.5 per cent silicon) to very finely dispersed particles of eutectic silicon.

The modified alloys should contain from about 8 to 15 per cent silicon; 12 per cent silicon makes a good alloy. The normal alloys may contain from 4 to 10 per cent silicon; 5 per cent silicon has been found to make a very satisfactory alloy for sand castings.

In the following paragraphs will be found values for a number of the physical properties of aluminum-silicon alloys, which are pertinent to their commercial application.

Density

Silicon is lighter than aluminum; its density is about 2.4, as compared with 2.7 for aluminum. The alloys have densities intermediate between these two values. The 10 per cent silicon alloy will have a density of approximately 2.65 grams per c.c. There is a tendency for the modified alloys to be slightly lower in density than the normal alloy, but the difference is not significant. The 10 per cent silicon alloy is 7 to 8 per cent lower in density than No. 12 alloy (8 per cent copper), and weighs approximately 166 lb. per cu.ft.

Expansivity

The splendid casting qualities of the aluminum-silicon alloys are in part the result of their relatively low shrinkage. The pattern shrinkage is the same as for other aluminum alloys—namely, $\frac{5}{32}$ (0.156) in. per foot. The aluminum-silicon alloys have a very much smaller crystallization shrinkage than either No. 12 alloy or pure aluminum. Pure aluminum contracts between 6 and 7 per cent in volume on solidifying; this contraction in volume results in the formation of a cavity or pipe. This crystallization shrinkage or contraction is reduced to 4 per cent or lower in the 12 per cent silicon alloy. The thermal expansivity of the 10 per cent silicon alloy is about 0.000021 per deg. C., in the range 20 to 100 deg. C.

Tensile Strength and Elongation

The modified alloy has considerably greater strength and ductility than the normal alloy. Typical results for various alloys are given in the following tabulation:

STRENGTH AND DUCTILITY OF ALUMINUM-SILICON ALLOYS AS CAST IN GREEN SAND

Composition	Character of Alloy	Tensile Strength, Lb./Sq.In.	Elongation, Per Cent in 2 In.
Silicon 5%	Normal	18,000	5-6
Silicon 8%	Normal	19,000	4
Silicon 8%	Modified	24,500	12
Silicon 13%	Normal	21,000	2
Silicon 13%	Modified	28,000	8

Better or poorer results than the above can be obtained with varying conditions. The proportion of iron

[1] A concise and authoritative account of their history was printed in *Chem. & Met. Eng.*, vol. 26, p. 750 (April 19, 1922).

[2] U. S. Pat. 1,410,461, J. D. Edwards, F. C. Frary and H. V. Churchill.

in the alloy should be strictly limited for the best result. Iron forms with silicon an iron silicide, which appears as needles in the microstructure. The modifying treatment has little refining effect on the particle size of this constituent, and its presence tends to reduce the ductility. The alloy as cast should preferably contain not over 0.5 to 0.6 per cent iron. The copper content of the modified alloy should also be held below about 0.8 per cent if the highest combination of strength and ductility is desired.

Electrical Conductivity

The modified aluminum-silicon alloy containing about 12 per cent silicon will have an electrical conductivity of about 34 per cent referred to the International Annealed Copper Standard; this conductivity is only slightly higher than that of No. 12 alloy. The conductivity of the normal alloy is usually somewhat lower than that of the modified alloy.

Thermal Conductivity

The thermal conductivity probably corresponds to the electrical conductivity—that is, it is slightly higher than that of No. 12 alloy. This statement is apparently confirmed by observations recently recorded in the literature.

Resistance to Corrosion

The aluminum-silicon alloys are quite superior to No. 12 alloy in their ability to resist most types of corrosion. This property is shared equally by the normal and modified alloys. The alkali metal added to effect conversion of the alloy to the modified form is present in such minute amounts that it exerts no apparent effect on the resistance to corrosion.

Machining Qualities

The aluminum-silicon alloys are not quite so easily machined as No. 12 alloy. They exhibit a very pronounced tendency to drag under the tool. Particles of excess silicon, if present, add greatly to the difficulty of machining or polishing, as they tear out readily, and are exceedingly hard and scratch the soft aluminum readily. Normal alloys containing less than about 11.5 per cent silicon will contain no excess silicon. Above this proportion, they may contain excess silicon unless completely modified.

Production of Castings in the Foundry

For the preparation of the alloy, the rich silicon alloy supplied by the Aluminum Company of America should be used.[3] This alloy contains approximately 20 per cent silicon, has a melting range of about 1,070 to 1,290 deg. F. (577 to 700 deg. C.), and dissolves readily in aluminum at temperatures not over 1,300 deg. F. High-grade ingot should be used in diluting the rich alloy to the required composition, so as to keep the iron content to a minimum. This point is mentioned again, for the highest strength and ductility are developed only when the iron is 0.6 per cent or under, and the rich silicon alloy, although made from a specially pure grade of silicon, may unavoidably contain considerable iron.

[3]It looks like plain advertising to state that "for the preparation of the alloy the rich silicon alloy supplied by the Aluminum Company of America should be used," and if it were just advertising such a statement would be out of place in this article. However, our experience has demonstrated that to obtain the results described, it is necessary that the alloy shall be prepared from that particular rich alloy. There are sound metallurgical reasons for this statement also, as the method of manufacture produces an alloy which has already been modified and which gives superior results in the subsequent alloying and casting.

Process of Modification

The Aluminum Company of America's process of producing modified alloy castings consists in adding to the aluminum-silicon alloy a very small percentage of metallic sodium. The correct amount of sodium to treat a definite weight of aluminum-silicon alloy is supplied in a sealed aluminum capsule. The aluminum-silicon alloy is heated to a temperature of about 1,500 deg. F. and the proper number of aluminum capsules placed in a phosphorizer, which is plunged to the bottom of the crucible. The phosphorizer, so called, is an inverted cup, formed from a graphite crucible or a short piece of iron pipe and held on the end of an iron rod; the iron parts are coated with graphite or lime wash to prevent attack by the aluminum. The aluminum capsules are wedged into the inverted cup and melt when plunged into the molten alloy. The melted sodium then escapes slowly into the alloy through a series of small holes in the sides of the cup near its top. The sodium diffuses through the metal, and a certain amount rises to the surface and burns. The liquid alloy should be kept up to a relatively high temperature until all of the sodium has disappeared from the phosphorizer. The operator can tell when all of the sodium has dissolved by lifting the phosphorizer until it comes in contact with the air. If there is no sodium flame, the modifying process is complete. When the modifying operation has thus been completed, the metal is skimmed. Stirring is not advisable, as it facilitates the oxidation and loss of the contained sodium. Skimming, however, should be performed with great care. When the metal has reached the proper pouring temperature, it can be cast in the usual way. As low a pouring temperature as possible should be employed. Too long a period should not intervene between the time of treatment and the time of pouring, if complete modification is desired. The metallic sodium is lighter than aluminum and relatively insoluble in it, so that it is gradually lost from the molten metal on standing. The modified alloy exists in a potential form only, in the liquid state; the actual modification results from the modified mechanism of solidification in the presence of the sodium.

Requirements for Electrical Mica

Requirements for mica for electrical purposes relate to dielectric strength, heat resistance and flexibility, states the Bureau of Mines in Serial 2,357. All good electrical mica is sufficiently resistant to heat for ordinary electrical equipment and this quality is, therefore, rarely specified. Specifications for dielectric strength vary for different uses and with different consumers for similar uses. Navy Department specifications call for a dielectric strength of not less than 25,000 volts for each ⅛ in. thickness. Mica has such a high dielectric strength that failures most commonly occur in defective spots. It is very important, therefore, in selecting material where high dielectric strength is required that the mica be given a careful visual examination so that all defective sheets may be rejected.

Department of Agriculture Exhibits

During the fiscal year 1921-22 exhibits by the United States Department of Agriculture were shown at about 70 fairs and expositions held in thirty-nine states and in the District of Columbia. These figures include many occasions for which special exhibits were prepared.

Recent Chemical & Metallurgical Patents

American Patents

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Electrolytic Refining of Tin—F. C. Mathers, of Bloomington, Ind., patents a modification of the Whitehead process (Patent 1,157,830; Oct. 26, 1915) whereby the electrolyte may hold as little as 2 per cent of tin, instead of 6, and 5 per cent of hydrofluosilicic acid, instead of 15 to 20. Furthermore, the amount of H_2SO_4 carried may be largely increased. Dense, coherent deposits, analyzing 99.9 per cent tin, may be had when electrolyzing impure Bolivian anodes, when to this electrolyte is added a fraction of 1 per cent of cresylic acid residues or mixtures of meta-, ortho- and para-cresol. Some unknown substance, which is common to these hydrocarbons, is thought to be responsible for the peculiar action of the electrolyte specified. (1,397,222; assigned to American Smelting & Refining Co. Nov. 15, 1921.)

Sulphonating Hydrocarbons — A method of sulphonating the aromatic hydrocarbons which is said to increase the efficiency of the sulphonating operation by decreasing the amount of sulphones formed during the process has been patented by A. R. Grob and C. C. Adams, of Wilmington, Del., and assigned to E. I. du Pont de Nemours & Co. The feature of the process is the use of liquid sulphur dioxide as a medium for the sulphonation process. The excellence of sulphur trioxide as a sulphonating agent is due to the fact that it is very active chemically—much more so from the standpoint of sulphonation than sulphuric acid or any other sulphur compound—and also because its sulphonates by direct addition without the formation of water. Its greater activity enables a sulphonation to proceed with less excess acid and without the employment of very high temperatures, which would have a tendency to cause decomposition. By preventing the formation of water, the isomeric rearrangement of the molecule is obviated. When sulphur trioxide is used undiluted, it acts too vigorously, making the reaction difficult to control and causing a greater degree of sulphonation than desired. It may cause charring and oxidation of the compound. It is usually diluted with sulphuric acid, but this makes a strong dehydrating mixture which favors decomposition, especially when oxygen is present in the compound, and also promotes the formation of sulphones. It is claimed that by diluting the sulphur trioxide with liquid sulphur dioxide, the action of the former can be made less vigorous and the reaction more easy to control. The presence of sulphur dioxide, which is a strong reducing agent, lessens oxidation. Finally, since the dehydrating action is minimized by using sulphur dioxide instead of sulphuric acid as a diluent, less decomposition and sulphone formation is encountered. The process is carried out by mixing a liquid sulphur dioxide solution of sulphur trioxide with a liquid sulphur dioxide solution of benzene, maintaining the resulting mixture under pressure until the desired degree of sulphonation has occurred, the temperature being maintained at about 0 deg. C. during the addition of the sulphur trioxide, and then permitting the temperature to rise to about 30 deg. C. under pressure. (1,422,564. July 11, 1922.)

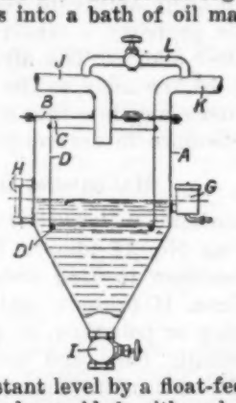
Pulp Washer—Carlton H. Allen, of Millinocket, Me., has assigned half rights in a modified pulp-thickening machine to the Great Northern Paper Co. The inventor has attempted so to design the apparatus that it will have a greater capacity for a given area of screening or filtering surface, produce more uniform results and be more easily repaired than machines heretofore used. The apparatus comprises a rotary drum with sixteen faces, covered with a wire cloth filter. The drum is supported on trunnions in a closed box so that it runs entirely submerged in the "stuff." The casing is constructed in such a manner that in two points on its circumference of the drum, contact is made between drum and casing by the layer of thick slushy pulp adhering to the filter. The pulp is discharged continuously from the casing between these two points of seal. The filtering is speeded by the hydraulic pressure maintained on the drum by the thin pulp supply. (1,421,364. July 4, 1922.)

Beryllium—A process for the extraction of beryllium from its ores which involves the reduction of the ore to the silicide or the carbide and a subsequent treatment with hydrochloric acid gas to form the volatile chloride of the rare metal is covered in a specification granted to Louis Burgess, of Bayonne, N. J. The ore is ground and mixed with a suitable hydrocarbon bonding agent, preferably a high-melting petroleum pitch which on heating will yield approximately 50 per cent of carbon. The mixture is placed in an electric furnace and is reduced by the heat of an arc, the operation being conducted under about 30 lb. pressure. The resulting product is ground and subjected to a treatment with hydrochloric acid gas at a temperature of about 450 deg. C. The beryllium chloride is volatilized by the heat and condensed in a series of chambers maintained at temperatures below that at which beryllium choride sublimes, but above the boiling or sublimation temperature of aluminum chloride or zirconium chloride, or approximately 200 to 250 deg. C. The beryllium chloride is then converted to the oxide by treatment with water. The second specification covers the application of the same idea to the metallurgy of zirconium. The chloridizing reaction is exothermic, and it is said that a very complete reaction is obtained by introducing the silicide or carbide as a powder into an atmosphere of hydrochloric acid gas. (1,418,527. June 6, 1922.)

British Patents

For complete specifications of any British patent apply to the Superintendent, British Patent Office, Southampton Buildings, Chancery Lane, London, England.

Gas Scrubber—Producer and like gas is simultaneously cleansed and enriched by passage through a porous screen fed with liquid by capillary action. The apparatus shown comprises a casing *A* tapered at the bottom and covered with a gas-tight lid *B* to which an annular flange *C* is secured, the flange having secured to it a wick or filtering cloth *D* weighted with a leaden rod or wire *D*¹. The lower edge of this wick dips into a bath of oil maintained



at a constant level by a float-feed chamber *G* and provided with a level indicator *H*. The gas entering by a pipe *J* passes through the wick, being thereby cleansed and enriched, and escapes by a pipe *K*. A bypass *L* is provided. The casing may be heated by engine exhaust gases or jacket water passed through a jacket. Impurities are removed through a valve *I*. A perforated ring of pipe may be disposed in the upper part of the casing in communication with the outlet *K*, or an annular chamber may be formed by the provision of a perforated disk fitted at right angles to the flange *C*. (Br. Pat. 181,102. T. G. Tulloch and D. J. Smith, London. Aug. 2, 1922.)

Calcium Hypochlorite — Calcium hypochlorite is rendered stable by mixing it, in the dry state, with purified sodium chloride, free from magnesium chloride and other hygroscopic impurities. The proportions are such that the product contains at least 10 per cent of active chlorine. The mixtures can be moulded into shape. (Br. Pat. 181,153. Chemische Fabrik Griesheim-Elektron, Frankfurt-on-Main, and H. Reitz, Bitterfeld. Aug. 2, 1922.)

Sulphuric Acid—In the manufacture of sulphuric acid, a stream of cold acid is made to trickle permanently over the whole inner surface of the walls of the lead chambers or towers for the purpose of protecting them from corrosion. Preferably chambers are constructed as cylinders or reversed truncated cones, cold acid being directed on to the walls by a turbine of resistant material placed axially near the top of the chamber and fitted with jets or wings to ensure the wetting of the whole inner surface. Nitrous vitriol may be introduced into the chamber in the same way. (Br. Pat. 180,546. E. A. Gaillard, Barcelona. July 19, 1922.)

Book Reviews

TECHNOLOGY OF CELLULOSE ESTERS. By *Edward Chauncey Worden, Ph.C., B.S., M.A., F.C.S.* Volume I, in five parts. Part 1, cxxv + 664 pp.; Part 2, cxvii + 902 pp.; Part 3, cxvii + 810 pp.; Part 4, cxvii + 710 pp.; Part 5, 623 pp.; 296 illustrations. New York: D. Van Nostrand Co., 1921. Price $40.

Work, for the night is coming,
When man's work is done.

This is the quotation selected by the author for the flyleaf of Vol. I, Part 1, of the above series, and regarded from the point of view of the magnitude of the task undertaken it cannot but be considered an appropriate one. Some idea of the labor involved in the preparation of the treatise may be gleaned from the fact that the accumulation of the entire material has extended over a period of 25 years and includes about 335,000 references relating to the work of 55,000 separate investigators and to 58,000 patent topics. In the words of the author, "The aim of the work is to present the entire subject of the combinations of normal and modified cellulose with the acidyl and alkyl radicles . . ."

The first volume (under review) consists of five parts—viz., Part 1, embracing the raw materials, cellulose, starch and cotton; Part 2, dealing with the manufacture of nitric, sulphuric and mixed acids; Part 3, describing the history, theory, chemical and physical properties of cellulose nitrates and other nitrated carbohydrates; Part 4, giving the synoptical development of the cellulose industry; and Part 5, containing the patent, name and subject index of the entire volume.

Volume I aims to give a complete review of cellulose, starch and cotton, and it is difficult to think of any branch of the subject to which reference is not made in some portion of the work, although it may not always be an easy matter to locate it. For example, the reader in a search of the literature on the decomposition of cellulose by bacteria will find, on consulting the index, only a single reference and this an incorrect one. If he should then recall that one of the important papers on this subject (published in 1912) relates to the intermediate formation of cellobiose as one of the degradation products and should search the index under this heading, his efforts would again be fruitless. It would be necessary for him to recall the name of the author—viz., Pringsheim—before he would be able to obtain the information desired. It may also be mentioned that while attention is drawn in the text (p. 339) to the fact "that in the breaking down of the cellulose molecule by the aid of bacteria no intermediate compounds have been isolated" the accepted work of Pringsheim proving the contrary—viz., the intermediate formation of cellobiose and dextrose—is quoted only as a note (p. 343).

A question of general interest is that of the manufacture of a highly purified cotton, and many chemists will feel that the method of Robinoff and Bay (as developed in the laboratory of Schwalbe) referred to casually (p. 144) in the discussion on hydrocellulose is a better one than that quoted by the author (p. 26).

No reference in the text could be found to the interesting work of F. Bergius on the action of water on cellulose at high temperatures and pressures, but on consulting the index it was located in a footnote under the heading of "Maltol" (!).

Part 2 contains a comprehensive review of the manufacture of nitric, sulphuric and mixed acid, and provides a wealth of information regarding the source of raw materials, manufacturing processes, analytical data, etc. Unfortunately the footnotes quoted suffer from a failing which is apparently common to the entire work—namely, the inclusion under a given heading, for example, nitric acid, of a large number of references, many of which do not refer to this specific subject, although they do refer to the nitrogen industry. It is to be regretted that it was not found possible to insert in the footnotes some kind of secondary classification through which their accessibility and usefulness might have been much increased.

There are also occasional statements in the text which are likely to mislead, as for instance the one quoted on p. 746 to the effect that "The du Pont company heats by means of an oil bath," the presumption being that this is an actual operation, whereas it merely represents a patent taken out in the name of F. T. Beers and assigned to the du Pont company.

On p. 988, Fig. 86, there is apparently a mistake in the title of the illustration, this reading "Jensen Nitric Acid Concentrating Plant," while in fact the drawing is from a patent granted to F. C. Zeisberg of the du Pont company on "Nitric Acid Concentration."

Part 3 takes up the historical development, theory and practice of nitrocellulose manufacture and undoubtedly represents the most complete bibliography of the subject in any language. It also contains a review of the preparation and properties of the nitrated carbohydrates, a description of the layout and construction of a modern guncotton plant and of the analytical data relating to cellulose nitrates.

In Part 4 the author states (p. 2378), "The subject matter of this section is intended as a general epitome of the more important and noteworthy of the technical advances of the cellulose esters . . ." It includes a description of the organic liquids used as solvents for the esters and the manufacture and use of synthetic and natural camphor, the greater part of the volume, however, being devoted to an account of the varied uses to which the cellulose esters have been applied in the industry.

Of Part 5 the author states in the introduction, "The belief formerly held by us that the index was the most important part of a technical work has long since become a conviction, many an otherwise valuable book having been materially impaired by the omission, incompleteness, brevity or faulty construction of the index—in our judgment without question the most important and painstaking portion of a work of this character"—an opinion in which the reviewer heartily concurs.

It is impossible to peruse the index without at once realizing the incredible amount of time, thought and actual drudgery which has been spent upon it by the author and his assistant, Mr. Rutstein. Technical chemists will be especially grateful for the valuable patent compilation, in itself a work of no small proportion, and readers of the volumes will doubtless consider it a duty to acquaint the author with any slips or omissions.

It is of interest that he states in the introduction, p. lx, "It is but necessary to glance at the 'Index of Names' in this volume to realize how essential it is that at least the initials of writers should always be given." Unfortunately, this idea is not always carried out, as for example in the case of the two authors designated under A. Hill, one of which should read A. J. Hill.

The reviewer is compelled to admit that the treatise contains many grammatical errors.

If considered as an authoritative work, it would be subject to criticism, but regarded from the point of view of a bibliography of the subject, it represents the most complete in existence and will undoubtedly take its place as part of the indispensable equipment of all workers in the field of cellulose chemistry.

No one can peruse the volumes without being impressed by the magnitude of the task undertaken and experiencing a feeling of gratitude toward the author. Add to this his statement in the introduction that "the entire cost of the preparation, printing and publishing of this work has been met by the author personally from his private funds," and it will be possible to realize to some extent the obligation under which he has placed his fellow chemists.

HAROLD HIBBERT.

Technical News of the Week

Current Events in the Chemical, Metallurgical and Allied Industrial Fields
Legislative Developments—Activities of Government Bureaus, Technical Societies and Trade Associations

Dye Embargo Dies Hard

Strenuous Attempts to Obtain Extension of Dye and Chemical Restrictions Fail—Will Attempt Readjustment of Rates at Next Session of Congress

WITH a quietus put upon the proposal to extend the dye and chemical embargo through failure of the Senate Finance Committee to report the resolution favorably and refusal of House leaders to act before this had been done, a definite move has already been started to attempt to get Congress to adjust the tariff rates on coal-tar products and synthetic organic chemicals by means of a separate bill.

The death of the proposed temporary extension of the dye and chemical control act was rather unexpected, in view of the letter of Secretary Mellon stating that the Treasury Department lacked the necessary machinery to administer tariff rates on coal-tar products on the basis of American valuations.

Finance Committee Rejects Proposal

The Senate Finance Committee considered the resolution proposing extension of the embargo for 3 months on three occasions, twice at a meeting Wednesday, Sept. 20, and again at a meeting Thursday, Sept. 21. The first vote in the committee was 5 to 3 against a favorable report. The resolution then was amended to read 60 days instead of 3 months and because of the small attendance at the committee meeting, it was decided that Senator McCumber should cast the votes of the absent Republican members, and Senator Simmons the votes of the Democratic absentees. On this vote there was a tie, 8 to 8, with Senators Smoot and LaFollette voting with the Democrats in opposition. It was generally considered that this tie vote ended the matter, but on the following day it was revived before the committee with fourteen of the sixteen members actually in attendance. Senator Reed of Missouri raised the point of order that inasmuch as this resolution affected the revenue of the country, it could not constitutionally be considered by a Senate body until it had been acted upon by the House. This point was sustained by a vote of 7 to 5, with Senators Smoot, LaFollette, Dillingham and Watson of Indiana joining the three Democratic members present. This ended the effort.

The House Ways and Means Committee had handled the resolution, which was introduced in that body by Representative Tilson, rather gingerly, and reported it favorably by a vote of 10 to 7, with three Republicans, Representatives Green, Watson and Young, voting with four Democrats against the report. Following this action, Republican members of the committee sent word to Senate leaders that they would not press the resolution in the House unless it first had been passed by the Senate, as they did not wish to be put in a position of attempting to push it through the House while there was a possibility that the Senate might not act favorably. Therefore no action further than this report was taken in the House.

Smoot Suspicious of Motive

In explaining his attitude, Senator Smoot declared that the Treasury Department had had an organization to administer the licensing system of the dye and chemical control act and that he thought this could easily be transferred and adjusted to administer the American valuation tariff rates. He would have been willing for a 60-day extension, he said, if he could have received assurances that no effort at the next session of Congress would be made to extend the embargo further. Most of the other leading opponents of the embargo had virtually agreed to withhold opposition from the resolution if the time were reduced to 60 days. Senator Wadsworth, sponsor of the resolution in the upper chamber, stated that he himself would not ask further extension at a later session of Congress but that he could not be understood as attempting to control the acts of other Senators.

Mellon Asks Time for Organization

In his letter regarding the administrative difficulties attendant upon inclusion in the tariff bill of American valuation on coal-tar products, which was addressed to Senator McLean in response to an inquiry from the latter and dated Sept. 7, Secretary Mellon asked that a 90-day extension of the dye and chemical control act be given so that the Customs Service might organize to administer these rates. The Secretary also asked that domestic manufacturers be compelled to file statements of their products with the

(*Continued on page* 663)

A.C.S. Committee Invites Criticism of Society Policies

Powers of Committee on Procedure Enlarged to Include All Matters Relating to Management and Policy

The committee of the American Chemical Society which was appointed at the Birmingham meeting to consider the advisability of changes in society procedure is endeavoring to collect all the specific questions which should be considered in this connection. The powers of the committee have been enlarged, by action of the advisory committee, to cover any subject relating to the management, procedure or policy of the American Chemical Society in order that there will be no doubt of the thoroughness of the inquiry. It was also voted to appropriate funds necessary for the proper functioning of this committee.

The vote passed at the meeting of the advisory committee in Pittsburgh Sept. 4 follows:

> Resolved, That the powers of the committee on progress in society procedure, voted at the Birmingham meeting, be enlarged and that the committee be requested to consider and report upon any subject relating to the management, procedure or business policy of the society requested by any local section, or which in their judgment should be investigated, in order that the society may have full confidence in the efficient handling of its affairs by its elected officers.
>
> Be it further resolved, That the committee on national policy request the directors of the society to appropriate, if possible, funds not exceeding $500 to enable the committee to meet together or to visit, as a committee, such offices of the society as they deem desirable, in order that their inquiry may have unquestioned thoroughness.

The committee is anxious to have the ideas of the various sections on specific questions which should be considered under this new scope. It is hoped that the criticism by individuals will be introduced at sectional meetings so that the report of the committee may embody its suggestions toward remedying all obsolete or objectionable methods of procedure in the conduct of the society.

Government Offers Sodium Nitrate

The War Department has called for bids on 26,900 short tons of sodium nitrate located at the Picatinny Arsenal, Dover, N. J. The material will be sold in lots of 100 short tons or more. The bids will be opened Sept. 29 at the Philadelphia District Ordnance Salvage Board.

New Muscle Shoals Resolution Would Vest Negotiations in War Department

Representative Hull Will Press Bill to Straighten Out Tangled Interests in Big Power Development for Most Advantageous Disposal

A NEW measure for the disposition of the government properties at Muscle Shoals, which in effect would pass the entire subject back to the Secretary of War, with authority to dispose of the various units on the best terms possible, appeared in the final days of the session of Congress in the form of a resolution introduced by Representative H. E. Hull of Iowa, a member of the Military Affairs Committee.

The resolution would authorize the Secretary to sell to the Alabama Power Co. the government's interest in the Gorgas steam plant and the transmission line to Sheffield at a price not less than $3,000,000, or if unable to negotiate a sale, the Secretary would be authorized to purchase the sites and rights of way from the Alabama Power Co. at a fair price within his discretion or to take the property by condemnation proceedings if necessary.

Purchase of all property and flowage rights abutting the site of proposed dam No. 3 and which belong to the Alabama Power Co. at a price not to exceed $100,000 would be authorized, condemnation proceedings to be instituted if agreement could not be reached.

The Secretary would be authorized to complete dam No. 2 at government expense and to construct dam No. 3 and to lease these dams together with the power houses and appurtenances for not to exceed 50 years at a rental of not less than 4 per cent of the cost of finishing dam No. 2 and constructing dam No. 3, including in the latter case the cost of the site and flowage rights. The lessee would assume the obligation of keeping the property in repair during the life of the lease.

May Lease Nitrate Plants

As to the nitrate plants, the resolution provides that the Secretary in his discretion may lease for not exceeding 50 years Nitrate Plants Nos. 1 and 2 and Waco quarry, either separately or completely, at $1 per year for each plant. The condition of such lease would be that the nitrate plant or plants should be operated at capacity for the production of fertilizer components for sale to the public at a price not to exceed 8 per cent profit and that the plants be kept in condition to produce to present capacity nitrates and other components of munitions, the plants together with their personnel to be turned over to the federal government in the case of a national emergency.

The Secretary would be authorized to lease the dams and nitrate plants and quarry separately or completely to the same lessee and to make the consideration interdependent.

Authority to sell or dispose of all lands and properties owned by the government not necessary for the operation of the nitrate plants, the steam electric plants or for the construction and operation of the dams will be given the Secretary.

Ultimate Disposal Open

In explaining his resolution, Representative Hull said that it was designed to solve the problems confronting the government in connection with the Muscle Shoals project. Its terms, he said, would permit Henry Ford or the Alabama Power Co., or any other reliable person or organization, to make the contract. Mr. Hull pointed out that even the Committee on Military Affairs, composed of twenty-one members, had found it impossible to solve the problems and he predicted that it would be still more difficult for the whole membership of the House to do so. Stating that while he had signed the majority report of the Military Affairs Committee, he realized that Mr. Ford might not accept the provisions of the McKenzie bill and that this measure might be materially amended during consideration. Mr. Hull declared that his resolution would afford the Detroit manufacturer or anyone else a better opportunity to operate the nitrate plants for the benefit of the people of the country than Mr. Ford's own offer. As for the Gorgas steam plant, which Henry Ford insists be included in his bid, Representative Hull declares that "in all fairness" the Alabama Power Co. is entitled to purchase this property. Mr. Hull also believes that a 50-year lease will meet greater approval from the people than the 100-year lease in the Ford bill.

Representative Hull states that he will press his resolution at the December session of Congress.

Bureau of Mines Concludes Clay Products Study

With the conclusion of comprehensive tests and observations at brick kilns at Bradford, Pa., and at Peoria, Ill., the Bureau of Mines car, Holmes, and its crew have concluded an extended series of tests throughout the country in cooperation with the manufacturers of heavy clay products. The tests at Bradford were at a kiln of the Dressler type. That test was of particular interest, since that type of furnace has been used almost exclusively in the making of expensive clay wares. It is contended, however, that this better type of kiln can be used to advantage in ordinary brick production, since it makes possible economies not practicable in the cheaper kilns.

The crew of the car now go to Columbus and Pittsburgh to complete their calculations and to prepare their report.

Paper Production Growing Rapidly in Canada

Output Is Increased by 38 Per Cent for First Half of 1922

While the United States leads in the production of newsprint paper, the Canadian mills are growing rapidly, according to an analysis just made by the paper division of the Department of Commerce. Statistics show that there was a marked increase in production during the first 6 months of 1922 as compared with the corresponding period in 1921.

Gaining on U. S.

Canada, during the period Jan. 1 to June 30, 1921, produced 373,988 tons, as against 615,448 tons produced in the United States. In the corresponding period for 1922 Canada produced 516,506 tons, as against 690,142 tons produced in the United States. This shows an increase of 38 per cent in Canadian production, as against 12 per cent in American production. Canadian shipments for same period increased 43 per cent over the corresponding period in 1921, while shipments from American mills increased only 13 per cent.

With these figures before us there can be no doubt about the growing competition from Canada. In the United States very little has been done in the way of additional equipment for the manufacture of newsprint, whereas in Canada a number of the large mills have greatly increased their productive capacity and with one of the largest American producers opening a mill in Canada it would seem that eventually this large industry will be transferred to Canada.

Question of Wood Supply

If this industry is to be kept alive in the United States, says the report, the main problem confronting us is the supply of pulp wood. It would perhaps be impossible for anyone to make a definite statement as to our total resources, but we do know for a certainty that the supply in our Eastern and Lake States is inadequate. Thirty per cent of the newsprint manufacturing industry is in New England, approximately 50 per cent in New York and 15 per cent in the Lake State regions, and in this district as a whole the annual cut of pulp wood greatly exceeds the forest growth. In other words, in this district we have mills without forests, whereas in the Western states and Alaska we have the forests with a practically unlimited supply, without adequate production facilities. Cost of transportation prohibits bringing Western pulp wood to Eastern mills.

Ceramic Study at Cornell

A series of tests of Florida clays is now being made at Cornell University, with a view to ascertaining the value of the local production for different branches of ceramic manufacture. As a result of the work, it is expected that the brick and clay products industries of the state will be expanded materially.

Big Guns to Entertain Visitors

Many Technical Men Expected at Aberdeen During Ordnance Tests

More than one thousand engineers are expected to attend the fourth annual meeting of the Army Ordnance Association, which will be held at the Aberdeen Proving Ground on Oct. 6. A program of test firings and demonstration of the more recent developments in ordnance material and ammunition has been arranged. A year ago a similar demonstration was attended by 800 engineers. So much of value to the members of a number of classes of engineering developed on that occasion that it is believed a much larger gathering will be had at this year's demonstration.

While the invitation is limited to members of the Army Ordnance Association, the American Society of Mechanical Engineers and the Society of Automotive Engineers, it is pointed out that there will be so many features on the program of interest to chemists, electrical and civil engineers that a large representation from these branches of engineering probably will be present. The requirements for an invitation can be met by anyone who is not a member of any one of the three societies mentioned by taking out membership in the Army Ordnance Association. Any American citizen is eligible to membership in that organization who is interested in extending and disseminating technical knowledge which has a bearing on the improvement of munition power as a factor in maintaining peace. Such a person can be enrolled as a member of the Army Ordnance Association on remitting $5 to cover the annual dues.

Tests of Flashless Powder

Chemists will be interested particularly in the tests of the recently devised non-hygroscopic, flashless, smokeless powder. The tendency of smokeless powder to absorb moisture has interfered with its ballastic properties. Efforts long have been under way looking to the control of the combustible gases which ignite on contact with the air and result in the flash which it is so desirable to eliminate in the use of artillery.

At the Railway and Seacoast Range a 16-in. gun en barbette and a 16-in. howitzer at high angle using solenoid chronograph will be demonstrated. Armor-piercing projectiles of various calibers which have passed through armor plate and the penetrated armor plate will be exhibited. Two 600-lb. bombs will be dropped from an airplane in the water, one with delay action fuse and one with instantaneous fuse.

Upon conclusion of the exhibition at the Railway and Seacoast Mount Range, the party will remain aboard the train and proceed to the aviation field. Upon arrival there, the party will detrain and inspect an exhibition of bombs, at which all types of American bombs and all available types of foreign bombs will be shown. The party will then witness a demonstration of machine gun firing from airplanes. This demonstration will be made on the ground in order that details may be visible. The plane is the DH4B, an observation and day bombing type. Firings will also be made with plane in air. The ammunition will be about 20 per cent tracer bullets.

The party will then inspect the airplanes and the dirigible balloons which are on hand at the proving ground. Flights will be made after inspection.

Luncheon will be served at the Visitors' House at 12:45 p.m. Immediately after luncheon the party will entrain and proceed to the main front, at which place it will detrain in order to witness the exhibition of various ordnance material.

At the main front a number of rounds will be fired from mobile artillery material for comparison. Firings will also be conducted from six powder guns or machine guns mounted in a moving tank, the target being an old tank on the main range.

Small Arms and Machine Gun Material

There will be a small arms booth at which will be shown the latest types of small arms and machine guns and their ammunition. Machine guns of various calibers will be fired with ordinary ammunition, armor-piercing ammunition and bursts of tracer ammunition. Firings of the 0.30-caliber and 11-mm. will be made against toy balloons and the 0.50-caliber against a tank or tank armor target.

At this time there will be dropped from planes one 2,000-lb. bomb for function test from an altitude of 8,000 ft., two 600-lb. bombs equipped with Mark V and VII nose and tail fuses. One fuse will be set for instantaneous function, the other for delay action.

As soon as the firings as outlined above have been completed a variety of self-propelled mounts, tanks, tractors and trailers will be exhibited and maneuvered.

Upon completion of the demonstration at the main front, the party will be conducted to the Exhibition Building for the purpose of inspecting the various automotive vehicles and other equipment in the building. Dinner will be served at 5:45 p.m., after which firings will take place from the main front, which visitors may witness if they so desire. A train will leave the Visitors' House for the main front for this purpose at 6:50 p.m. These firings will include demonstration of flashless powder, 75-mm. gun or other caliber; 0.30-caliber tracer ammunition; 11-mm. tracer ammunition; 0.50-caliber tracer ammunition; pyrotechnics.

Immediately after this firing, at about 7:30 p.m., the Proving Ground train will leave the main front, stopping at the Visitors' House for the purpose of taking the party to Aberdeen to catch the trains going north and south.

Action of Alkali on Concrete to Be Studied

Canadian Interests Co-operate in Investigations of Effect of Soil

The governments of the Dominion, Alberta and Saskatchewan, the Canadian Pacific Railway and the Canada Cement Co. have provided funds and have appointed a committee of experts under the chairmanship of Prof. C. J. Mackenzie, of the University of Saskatchewan to make an investigation of the action of alkali soils and waters on concrete. In a number of instances in the prairie provinces the action of alkaline salts in the soil has so deteriorated concrete foundations that alarm is felt for the safety of structures superimposed on them.

The word "alkali" as applied to soils and waters is used exceedingly loosely in the west, being made to cover practically any salt of the alkalis or alkaline earths, or any group of such salts, quite regardless of whether they are acid, alkaline or neutral. The nature of so-called alkali waters varies enormously in different parts of the Canadian West. Lakes are found within a comparatively short distance of each other in which the predominating salts are sodium sulphate, sodium carbonate and magnesium sulphate, respectively; and these salts occur in sufficient quantity to make the commercial recovery of them a profitable enterprise during the drier months of the year, when the concentration is greatest. In the northern part of the prairie provinces springs, the waters of which are saturated with sodium chloride and with sodium and magnesium chlorides, are common, so it will be evident that the investigators have a broad problem before them, for, obviously, a remedy that might combat one form of "alkali" may be ineffective against another.

A fund has been created to finance the work totaling $13,200, of which the Research Council of Canada gave $5,000.

Chemical and Physical Tests

It was decided to divide the work into two phases: physical field tests and chemical research. Two hundred and fifty blocks of cement were exposed to the action of alkaline water at different points, this stage of the experiments being conducted under the charge of Professor Williams of the University of Saskatchewan. The work is now about to enter on the second stage, that of chemical research. The test blocks will be taken to the University of Saskatchewan and there chemical research work will be carried on under Professor Thoroldson, assisted by five chemists. It is not expected, however, that any results will be ready for publication for another year.

Disintegration of cement construction, under the influence of alkaline water, has, it is stated, reached such a point that until more is known, it is doubted whether cement can be used where alkaline water is encountered.

Hearings Open on Bill Providing Hydraulic Lab

Advocates Claim That Establishment Would Pay Dividends

In the course of the hearing on the bill providing for a National Hydraulic Laboratory, Senator du Pont of Delaware pointed out that industries are doubling and trebling their laboratory expense. John R. Freeman, the president of the American Institute of Civil Engineers, in advocating a laboratory to study flood control and all the problems of river hydraulics, declared that in his experience of more than 40 years he had never known a laboratory of any character which had not paid dividends, in some cases as high as thousands per cent.

Secretaries of the three executive departments that will be affected by this legislation were asked to submit reports and opinions on its establishment. The Secretary of Commerce and Secretary of the Interior see in the laboratory an important aid in solving problems of river hydraulics, while the Secretary of War submitted an adverse report, which is believed to reflect the opinion of the Corps of Engineers.

Secretary Hoover has submitted the following opinion: "There are many problems arising in connection with hydraulics, irrigation and the determination of the fundamental laws relating to stream flow and deposit which such a laboratory would assist in solving. Without question, the solution of the tremendous waste problem due to floods rests on fundamental data concerning the flow of water, the wearing of structural and natural materials, the transportation of material and water, and chemical and physical deposition, together with such general field data as can be gathered all over the country."

Secretary Fall states: "This department for many years has recognized the necessity and the value of scientific research in river hydraulics undertaken to obtain accurate and reliable data for use in the design, construction and operation of works intended for the utilization and control of the rivers of the country."

Weeks Opposed

In contrast to these opinions, the Secretary of War states that: "The hydraulic laboratory proposed would have no value whatever in solving flood control." He further states that he "would regard it as a misapplication of government funds to establish such a laboratory for the study of flood problems."

Further extracts from his letter are as follows: "The measures that can be taken to control floods are limited to the construction of dams to hold back the waters, levees to prevent them from overflowing the land, and such enlargements and outlets as may be practicable to pass the flood as promptly as possible to the sea. I omit reforestation, which some claim would have a beneficial effect, as, in my opinion, any effect of reforestation on the flood problems of this country is too insignificant to warrant serious consideration.

"It has been established that the reservoir control of the Mississippi flood problem is not practicable. In any event, the art of dam construction is so far advanced in this country that a national hydraulic laboratory is not necessary to advance that science. The hydraulic laboratory is certainly unnecessary to determine the proper design of the levees.

"There remains the problem of the practicability of designing outlets on the basis of laboratory experiments. I think it should be clear that the forces of nature let loose in a flood in one of our great rivers cannot be reproduced in a laboratory."

Ohio State Chemists at Pittsburgh A.C.S. Meeting

The accompanying photograph, taken on the steps of Carnegie Music Hall during the Pittsburgh meeting of the American Chemical Society, shows the large representation of chemists from Ohio State University that attended the meeting. The picture was taken immediately after the Ohio State luncheon on Sept. 6 at which ninety were present. Many meetings of various institutions were held during the convention, but this was the largest luncheon or dinner attendance reported by a single university.

Birds' Happy Home Doomed by Oil Seekers

Charles Stewart, Dominion Government Minister of Interior, has announced that his department has made an arrangement with a powerful United States syndicate by which the famous Pakowski bird sanctuary is to be thoroughly explored for oil. The bird sanctuary, which is 44 square miles in extent, lies immediately to the north of the Sweetgrass oil field in Montana and according to Dr. Dowling, oil expert for the Canadian Geological Survey, the oil-bearing formation extends well into southern Alberta.

Under the terms of the arrangement, the syndicate has been granted three leases of 640 acres each, and in the event of discovery is to be granted one-half of the whole sanctuary, in consideration for which it is to explore thoroughly the leases it has been granted. Mr. Stewart points out that the Dominion Government will retain the other half of the sanctuary, which, in the event of the discovery of oil in commercial quantities, will be greatly enhanced in value. Mr. Stewart stated that he recently visited the Montana field, where forty drilling outfits are at work. Work already has been started on the Canadian side, and Dr. Dowling is on the ground, watching developments on behalf of the Dominion Government.

American Sulphur Industry Competing Successfully With Italian

A message from Palermo, Italy, says that owing to the development of the sulphur industry in America and the fall in freight rates, American producers are competing very keenly on the sulphur market and the situation of Italian producers is becoming daily more difficult. The consortium holds stocks which cannot be disposed of except at serious losses. The following figures show the decrease in the export of Sicilian sulphur and the increase in the American production:

	Metric Tons	
	1920	1913
Italian exports.....	148,044	351,338
American production	1,230,000	498,937

Short Course for Flour Chemists an Innovation in Education

Unique in being the only educational project of its kind in the world, a 4-day short course for flour mill and bakery chemists has been scheduled at the University of Minnesota for Jan. 2 to 5, 1923. Complete and intensive instruction in the latest developments in the chemistry of flour and baking will be given by university experts of the agricultural biochemistry division. Supplementary lectures on wheat classification, wheat breeding, wheat diseases and insects infesting wheat and flour are also planned. Attendance will be restricted to twenty-four, and registration opens Oct. 1, 1922.

Canadian Paper Makers Oppose Development of Newfoundland

British manufacturers of print and other pulp papers have joined with Canadian manufacturers in opposing British aid to the proposed pulp and paper industry development of Newfoundland and admit in their protest to the British Government that their opposition is based on the fact that manufacturing costs in Newfoundland will be so small that the closing of British mills will result.

This information was contained in a cablegram received from Sir Richard A. Squires, Premier of Newfoundland, who has been in London several weeks negotiating with the Imperial Government for aid under the British trade facilities act. The proposed development in Newfoundland includes the harnessing of the Humber River. The cablegram received from Premier Squires follows:

"Canadian pulp and paper interests have succeeded in getting the Paper Makers Association of Great Britain and Ireland to enter formal protest to the Imperial Government against any guarantee being granted under the trade facilities act for the development of water power and timber areas in Newfoundland, on the ground that timber areas in Newfoundland are so vast and water power so gigantic that the manufacture of pulp and paper in Newfoundland on a large scale would have the effect of closing the paper mills in Great Britain because Great Britain paper manufacturers could not compete with Newfoundland manufacturers in quality or price."

Trade Association Will Foster Russian Paper Industry

That the immense possibilities of Russia as a source of wood pulp and paper are not being overlooked by the Soviet Government is indicated by the organization of a so-called Tecnic-Economical Council of the paper industry which has recently been formed, with headquarters in Moscow. The report of the formation of this organization sets forth as its object the correlation and dissemination of scientific, technical and economic information for the benefit of the industry and the education of the public. The council plans to maintain a library, an experimental laboratory and a vocational training school, and plans to enter into relations with the scientific and technical associations of Europe and America.

The council has three sections—the technical, the economic, and the professional instruction sections. General meetings are to be held every 2 months. The board of directors consists of five persons. Work of the council is financed by the manufacturing concerns which make up its membership.

Reports are current of the formation of an American company for the operation of a pulp and paper mill in Russia, which has been approved by the Soviet. The names of the Americans who are promoting the enterprise have not been made public, and particulars of the plant and its location are not at present available.

E. C. Franklin Plans Lecture Tour

At the Pittsburgh meeting of the chairmen and secretaries of the various divisions of the American Chemical Society, a plan was launched by which Prof. E. C. Franklin of Leland Stanford University will give a series of lectures before several of the local sections of the society. These will be given near the time of the spring meeting—that is, the latter part of March and the early part of April. The following sections have asked Dr. Franklin to speak before them on this trip: Chicago, Detroit, East Lansing, University of Michigan, Purdue, Cleveland, New Orleans, West Virginia, Pittsburgh, Buffalo, Rochester, Syracuse and Philadelphia.

If there are other sections of the American Chemical Society or other scientific bodies which would like to have Dr. Franklin speak before them, information can be obtained by writing to E. M. Billings, Kodak Park, Rochester, N. Y.

Free Courses in Dyeing at New York Textile School

Registration is now open at the New York Evening Textile High School, 124 West 30th St., New York City, for two courses in dyeing which will enable those interested to obtain a wider perspective of the entire field of the textile and dyeing industries.

The first of these courses, the elementary, is given on Monday and Wednesday evenings, and the advanced course on Tuesdays and Thursdays. The class is held from 7 to 9 p.m. and the work is partly lecture and partly laboratory, the former consisting of talks on textile fibers and dyes, while the latter covers practical dyeing. From time to time lectures will be given by authorities in the profession. All instruction and materials are free.

Capital Increases Rumored for German Dye Concerns

A Berlin dispatch to the New York *Times*, dated Sept. 24, states that new stocks in the German dye industry to the extent of 1,800,000,000 marks are expected to be thrown on the market in the near future. As a forerunner of this the directorates of two large firms already have decided to virtually double their capital stock.

The firm of Farbwerke, formerly known as Meister Lucius & Bruening of Hoechst-on-Main, has voted an increase of 470,000,000 marks, which will make a total capital stock of 940,000,000 marks. Other concerns in this group have similar increases in prospect. The directorate of the Chemische Fabriken has decided to increase its total stock from 33,000,000 to 64,000,000 marks.

Regulation of Butter Substitutes in Canada

Under the regulations effective Aug. 19, importation, manufacture and sale of margarine in Canada shall be by special license only, and the manufacture of nut butters and oleomargarines is prohibited wherever the manufacture of butter or the reworking of rancid butter takes place, Vice-Consul Vyse, Ottawa, informs the Foodstuffs Division of the Department of Commerce. Even the materials used for the manufacture of dairy butter substitute must undergo official government inspection and approval, so interested are the dairies in safeguarding the health of the people preferring nut butters. If a picture of a cow or the name of any breed of cattle or the words "butter," "creamery" or "dairy" appear upon the package of dairy butter substitute or are used in advertising the article, the manufacturers are heavily liable.

Among the many sale restrictions there is one that margarine must be sold in the original package, must be stamped with the official inspection seal of the Canadian Dominion, Ministry of Agriculture, and must conspicuously bear the word "oleomargarine." If a restaurant, hotel or lunch room serves margarine and doesn't announce that fact by prominent notices around the walls of the dining rooms, in the kitchens and elsewhere, it is a violation of the law and will cost about $500.

Chemical Industries Growing in India

The Bengal Agricultural and Industrial Committee has recommended the expansion of the manufacture of sulphuric acid and the establishment of factories for the manufacture of white lead, red lead, etc. Raw materials are readily obtainable.

The question of the manufacture of cement in the Jaffma island is being investigated. The experiments in testing materials carried out by the Technological Institute at Cawnpore have proved the feasibility of starting cement factories at Cawnpore and Lucknow.

The Director of Industries, Mysore, has been asked by the Durbar to ascertain if any private capitalist is willing to establish a paper factory in the state under the scheme prepared with the assistance of Bertram & Sons, of Edinburgh.

It is understood that the Nizam's Government has granted concessions to the Oosmania Mills Co., Ltd., which has been registered with a capital of one crore to start four cotton mills in the Hyderabad State.

Civil Service Openings

The U. S. Civil Service Commission announces the following open competitive examinations: Laboratory assistant, senior grade, at $1,200 to $1,380 a year; laboratory assistant, junior grade, at $1,000 a year; senior aid, at $900 a year; junior aid, at $540 a year, and junior aid, grade 2, at $720 to $840 a year.

Dye Embargo Dies Hard

(Continued from page 658)

Secretary; that imports be confined to certain specified ports; and that the tariff bill be amended so as to provide that the decision of the Secretary as to similitude be final and without appeal. Subsequent to the receipt of this letter the tariff conferees extended the embargo in the bill and placed the rates on coal-tar products on foreign valuation. They, therefore, did not make any changes in the text suggested by the Secretary. The House rejected the embargo and recommitted the bill to conference to have it stricken out. In their second conference, which lasted only 4 hours, the conferees changed the basis of the valuation on coal-tar products back to the American selling price and changed the figures in the paragraph, but found themselves unable to make the changes in phraseology which had been suggested by Secretary Mellon.

The greatest difficulty expected in administering the tariff on coal-tar products as it appears in the bill now is in determining similitude. The paragraph reads that imported dyes and chemicals from a coal-tar base shall be assessed for duty on the basis of the selling price of a comparable American product and that a domestic product may be considered comparable with an imported product if it produces results "substantially equal." The determination of whether results are similar is expected to lead to considerable litigation. In a case where similitude is not claimed and where there is no directly comparable American product, the rates are to be assessed on the foreign selling price or the export price, whichever is the higher.

Plan to Ask Readjustment of Rates

The movement for rearrangement of the duties not only on coal-tar products but upon synthetic organic chemicals of non-coal-tar origin was begun before the death of the temporary embargo extension. In a letter to all Republican members of Congress, dated Tuesday, Sept. 19, Dr. Charles H. Herty, president of the Synthetic Organic Chemical Manufacturers' Association, asked that the embargo be extended for 3 months and in concluding his letter said: "The enactment of this resolution will protect our industry and give time for the framing of legislation based on rates, which will safeguard the uncompleted American industry."

The exact basis of rates which will be asked when Congress reconvenes has not been determined, but in general it is proposed to increase greatly the 25 per cent ad valorem foreign valuation duty on synthetic organic chemicals (under the general or "basket" clause) and to rearrange completely the rates on coal-tar products. It is proposed in the case of the latter to make more than one rate, as it is claimed that some of the products need very high protection, while others can exist on low protection. The rates in the new tariff act on coal-tar products are 55 per cent ad valorem, American valuation, plus 7 cents per pound on intermediates, and 60 per cent ad valorem, American valuation, plus 7 cents per pound on finished products, these rates to continue 2 years, after which the ad valorems are to be reduced to 40 and 45 per cent, respectively.

Wisconsin Gives First Course in Paper Making by Mail

The first correspondence study course on the manufacture of pulp and paper will be given this September by the University of Wisconsin extension division in co-operation with the Forest Products Laboratory. The vocational education committee of the pulp and paper industry and the Wisconsin Board of Vocational Education helped to plan the course.

Five courses based on the textbooks prepared by the vocational education committee of the pulp and paper industry will be given. According to the co-operative arrangement, the extension division will administer the courses and the Forest Products Laboratory will correct the papers and have actual charge of the teaching of the courses. All of the information in the laboratory files and such technical advice as the members of the pulp and paper staff can give will be available to all students who take the course.

Railroad Must Stand Cost of Spotting Freight Cars

The Indiana Harbor Belt R.R. Co. has been ordered to pay the United Chemical and Organic Products Co. and the Central Chemical Co. of West Hammond, Ill., the costs of terminal service performed by the chemical companies' engine. The spotting of cars and other work in handling shipments from their own establishments was undertaken by the chemical companies when the belt railroad was not in a position to furnish prompt and adequate terminal service.

Paper Mill for East Kootenay, B. C.

The Wigwam Pulp & Paper Co., Ltd., has been formed for the purpose of building a pulp and paper mill at Philip's Bridge, 9 miles from Elko, in the East Kootenay region of British Columbia. The company is composed of United States and Canadian capitalists, the Chicago *Tribune* and other large daily paper owners being interested. The plant is to be built in three units, each having a daily capacity of 100 tons of newsprint, and a contract for the construction of the first unit, which is to cost $3,500,000, has been let to McDougald-McNeil, Ltd., of Calgary.

It is stated that it will take 3 years to build the complete plant, which will cost in the neighborhood of $12,000,000 and when finished will give employment to 1,500 men. Timber limits assuring a supply of pulpwood over 30 years are said to have been obtained, also water rights on the Elk and Bull rivers, providing ample power.

Natural Tannic Acid Plant to Be Established in Fiji Isle

Melbourne, Australia, papers report that the Doga Timber & Tannin Extraction Company has been formed in Suva, Fiji, for the purpose of extracting tannic acid from the bark of the doga tree, which grows in the mangrove swamps on the foreshores all around the islands. The proposal is to extract the tannic acid and ship the crystals to England. The company has a monopoly of Vitilevu, the largest island. Machinery has been imported, and operations are to be started soon.

Personal

Edward Bartow and his family returned to the United States Sept. 2 after a 3 months' trip in Europe.

A. B. Davis and R. W. Hilton, formerly with the firm of Ault & Wiborg, have formed the firm of Hilton & Davis, to be manufacturers and distributors of fine chemicals.

Federico Giolitti is at present in the United States.

Harry H. Hill, formerly superintendent of the Bartlesville experiment station of the Bureau of Mines, has been designated to succeed F. B. Tough as supervisor of oil and gas leases. He will be succeeded by Theodore E. Swigart.

H. W. Loebel of McGill University, Montreal, Canada, has recently been added to the staff of the National Malleable Castings Co., Chicago, Ill.

Russell E. Lowe, formerly works manager and technologist for the Maine Power Sales Co., maker of ferroalloys, is now metallurgist in charge of operation for the Bario Metal Corporation of New York.

R. B. Moore, chief mineral technologist of the Bureau of Mines, is making a tour of the bureau's experiment stations in the West.

Henry C. Pearson, editor of the *India Rubber World*, will celebrate on Oct. 1 the thirty-third anniversary of the publication of which he has been editor from the beginning. Not only are there few business publications today that have reached the advanced age of 33, but there are still fewer editors who enjoy the unique distinction of having directed the editorial policies of their magazines from the beginning. *Chem. & Met.* extends its congratulations and best wishes.

J. A. Steffens, for the past 5 years chemical engineer of the U. S. Industrial Alcohol Co. at the research laboratories in South Baltimore, Md., has resigned and will engage in business for himself in New York.

William Stericker, formerly an industrial fellow at the Mellon Institute, Pittsburgh, Pa., is now research chemist with the Philadelphia Quartz Co., Philadelphia, Pa., the donor of the fellowship Mr. Stericker held at the Mellon Institute.

Market Conditions

In Chemical, Metallurgical and Allied Industries

A Survey of the Economic and Commercial Factors That Influence Trade in Chemicals and Related Commodities Prevailing Prices and Market Letters From Principal Industrial Centers

The Tariff Act of 1922 and Its Probable Effect on the Chemical Market

A Study of the Rates of Duty and Administrative Provisions Most Likely to Influence Trade in the Products of the Chemical Industry

DOUBTLESS the single factor most likely to have permanent effect on market conditions in the chemical and allied industries is the new tariff law, signed by the President on Sept. 21, 1922. A certain measure of relief is to be felt immediately simply because the final enactment of the Fordney-McCumber bill puts an end to the 20 months of uncertainty which have characterized its making. To be sure, there is a wide difference of opinion as to probable revenue yields, the effects on domestic prices and on foreign trade, but aside from these controversial issues there are certain provisions in the new law which are of vital and immediate interest to the chemical industry.

Tariff Chronology

Jan. 6, 1921. Hearings began by Ways and Means Committee.
June 29, 1921. Bill introduced into the House of Representatives.
July 21, 1921. Passed by House.
July 22, 1921. Referred to Senate Finance Committee.
July 25, 1921. Hearings begun by Finance Committee.
Jan. 3, 1922. Hearings concluded.
April 11, 1922. Reported to Senate.
Aug. 19, 1922. Passed by Senate.
Aug. 22, 1922. Referred to conference.
Sept. 11, 1922. Reported by conference.
Sept. 13, 1922. Returned to conference by House.
Sept. 15, 1922. Conference report approved by House.
Sept. 19, 1922. Conference report approved by Senate.
Sept. 21, 1922. Fordney-McCumber tariff signed by the President.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	146.86
Last week	146.67
September, 1921	147
September, 1920	267
April, 1918 (high)	286
April, 1921 (low)	140

Indications are that the chemical market has already reached the lowest level of its present movement and unless interrupted by difficulties now unforeseen, it may be expected to show a gradual but material improvement within the next few months.

The Possibilities in the Flexible Tariff

The outstanding feature of the new law is the provision empowering the President to raise or lower duties following the recommendation of the Tariff Commission. Under this arrangement rates of duty can be altered within the range of 50 per cent in order to meet changing conditions of competition or to correct inequalities in the operation of the different provisions. The surrender to this extent of the Congressional prerogative of rate making is the first step toward taking the tariff out of politics and placing it on a logical and scientific basis. This provision offers many difficulties in the way of administration, but the success or failure of the new law will depend largely on the way in which the flexible tariff clauses are interpreted by the executive and administrative agencies.

As in all previous tariff acts, the ad valorem rates are based on foreign valuation with the single exception of coal-tar products, where the American selling price is the basis of assessment. It will be recalled that the House originally applied American valuation to the entire act, but because of very strong protest the provision was eliminated by the Senate. It is significant, however, that under the flexible tariff clause the President may extend American valuation to other articles where the additional protection is deemed necessary.

Dyes and Coal-Tar Products

The chemical industries are most concerned with the rates imposed on their products. In the accompanying table these rates have been compared

A COMPARISON OF THE RATES OF DUTY ON IMPORTANT CHEMICALS IN THE FORDNEY-McCUMBER TARIFF ACT OF 1922 AND IN ITS PREDECESSOR, THE UNDERWOOD-SIMMONS ACT OF 1913

(Specific Duties are on per pound basis unless otherwise noted.)

Commodity	Underwood-Simmons Act of 1913	Fordney-McCumber Act of 1922
Acetic acid, 65% and less	Free	½c.
Acetic acid, over 65%	Free	2c.
Acetic anhydride	2½c.	5c.
Boric acid	½c.	1½c.
Chloroacetic acid	15% n.s.p.f.*	5c.
Citric acid	5c.	17c.
Lactic acid	1½c.	2c.–9c.†
Tannic acid and tannin	5c.	4c.–20c.†
Tartaric acid	3½c.	6c.
Arsenic acid	Free	3c.
Formic acid	1½c.	25% n.s.p.f.
Gallic acid	6c.	8c.
Oleic acid	15% n.s.p.f.	1½c.
Oxalic acid	1½c.	4c.
Phosphoric acid	Free	2c.
Pyrogallic acid	12c.	12c.
Stearic acid	15% n.s.p.f.	1½c.
Acetaldehyde, etc.	15% n.s.p.f.	6c.+30%
Acetone	1c. per lb.	25%
Alcohol, amyl	½c.	6c.
Alcohol, butyl and propyl	½c.	6c.
Fusel oil	½c.	6c.
Alcohol, methyl	Free	12c. per gal.
Alcohol, ethyl	$2.60 gal.	15c. per pr. gal.
Aluminum hydroxide	15%	½c.
Alums	15%	½–1½c.†
Aluminum compounds	15% n.s.p.f.	25%
Ammonium carbonate	½c.	1½c.
Ammonium chloride	½c.	1½c.
Ammonium sulphate	Free	½c.
Anhydrous ammonia	2½c.	2½c.
Antimony oxide	25%	2c.
Tartar emetic	15% n.s.p.f.	6c.
Argols and wine lees	5%	5%
Cream of tartar	2½c.	5c.
Rochelle salts	2½c.	5c.
Balsams, crude	10%	10%
Balsams, refined	15%	
Barium carbonate	15%	1c.
Barium chloride	½c.	1½c.
Barium dioxide	1½c.	4c.
Barium hydroxide	15% n.s.p.f.	1½c.
Barium nitrate	15% n.s.p.f.	2c.
Bleaching powder	½c.	½c.
Caffeine	$1	$1.50
Tea waste	1c.	1c.
Calcium carbide	Free	1c.
Calomel	15%	45c.
Carbon tetrachloride	1c.	2½c.
Chloroform	2c.	6c.
Casein	Free	2½c.
Casein plastics, unfinished	Free	25%
Casein plastics, finished	10%	40c.+25%
Chalk, precipitated	25%	25%
Chicle, crude	15c.	10c.
Chicle, refined	20c.	15c.
Chloral hydrate	25%	35%
Terpin hydrate	25%	35%
Thymol	25%	35%
Urea	25%	35%
Glycerophosphoric acid	25%	35%
Coal-tar products: Intermediates used in manufacture of dyes, medicinals, explosives, photographic chemicals, perfumes, etc.	10%	7c.+55%‡
Coal-tar products: dyes, color lakes, medicinals, explosives, photographic chemicals, aromatic chemicals, tanning materials, etc.	30%	7c.+60%‡
Cobalt oxide	10c.	20c.
Collodion	1c.	35c.
Pyroxylin, unfinished	25%	40c.
Pyroxylin, finished	40%	60%
Drugs, crude, exotic	Free	Free
Drugs, crude domestic	Free	10%
Drugs, exotic advanced in value	10%	10%
Buchu leaves	10c.	10c.
Coca leaves	10c.	10c.
Gentian	½c.	½c.
Licorice root	½c.	½c.
Sarsaparilla root	1c.	1c.
Belladonna	10%	25%
Digitalis	10%	25%
Henbane	10%	25%

Commodity	Underwood-Simmons Act of 1913	Fordney-McCumber Act of 1922
Stramonium	10%	25%
Cyanide: potassium cyanide, sodium cyanide, compound and mixtures	Free	Free
Ergot	10c.	10c.
Diethylsulphate	15% n.s.p.f.	25%
Dimethylsulphate	15% n.s.p.f.	25%
Ethyl acetate	5c.	3c.
Ethyl chloride	20%	15c.
Ethyl ether	4c.	4c.
Extracts for dyeing and tanning	½c.	15%
Flavoring extracts, non-alcoholic	20%	25%
Formaldehyde	1c.	2c.
Paraformaldehyde	1c.	8c.
Hexamethylenetetramine	15% n.s.p.f.	25%
Glycerine, crude	1c.	1c.
Glycerine, refined	2c.	2c.
Gums: amber and ambroid	$1	$1
Gum arabic	½c.	½c.
Ink and ink powders	15%	20%
Iodine, resublimed	Free	20c.
Bromine	Free	10c.
Bromine compounds	15% n.s.p.f.	10c.
Lead acetate, white	1½c.	2½c.
Lead acetate, brown	1c.	2c.
Lead nitrate, arsenate and resinate	1½c.	3c.
Lime, citrate of	1c.	7c.
Magnesium carbonate	1½c.	1½c.
Magnesium chloride, anhydrous	15% n.s.p.f.	1c.
Magnesium chloride, n.s.p.f.	15%	½c.
Magnesium sulphate	0.1c.	½c.
Magnesium oxide	3½c.	3½c.
Magnesia, calcined	Free	3½c.
Manganese compounds	15% n.s.p.f.	25% n.s.p.f.
Menthol	50c.	50c.
Camphor, crude	1c.	1c.
Camphor, refined	5c	6c.
Oils, animal, n.s.p.f.	15%	20%
Oils, fish, n.s.p.f.	3c. per gal.	20%
Oils, vegetable, n.s.p.f.	15%	20%
Castor oil	12c. per gal.	3c.
Cottonseed oil	Free	3c.
Coconut oil	Free	2c.
Soya-bean oil	Free	2½c.
Hempseed oil	3c. per gal.	1½c.
Linseed oil	10c. per gal.	3.3c.
Olive oil, less than 5 gal.	30c. per gal.	7½c.
Olive oil, more than 5 gal.	20c. per gal.	6½c.
Peanut oil	6c. per gal.	4c.
Poppyseed oil	6c. per gal.	2c.
Rapeseed oil	6c. per gal.	6c. per gal.
Turkey-red oils	25%	35%
Oils, essential, n.s.p.f.	20%	25%
Orange and lemon oils	10%	25%
Peppermint oil	25c.	25%
Opium, crude	$3	$3
Opium, manufactured	$4	$4
Morphine	$3 per oz.	$3 per oz.
Cocaine	$2 per oz.	$2.60 per oz.
Perfume materials, synthetic	20%	45%
Perfume materials, animal	Free	20%
Perfume mixtures and compounds	20%	40c.+50%
Perfumery, alcoholic	40c. + 60%	40c. + 75%
Perfumery, non-alcoholic	60%	75%
Floral waters	20%	20%

Commodity	Underwood-Simmons Act of 1913	Fordney-McCumber Act of 1922
Bay rum	$1.75 per pr. ga.	40c. + 60%
Paris green	Free	15%
Phosphorus	Free	8c.
Paints, artists'	20%	40%
Paints and pigments, n.s.p.f.	20%	25%
Barytes, crude	15%	$4 per ton
Barytes, ground	20%	$7.50 per ton
Prussian blue	20%	8c.
Ultramarine	15%	3c.
Bone black	15%	20%
Decolorizing carbons	Free	20%
Chrome colors	20%	25%
Gas black	15%	20%
Litharge	25%	2½c.
Orange mineral	25%	3c.
Red lead	25%	2½c.
White lead	25%	2½c.
Ochers, siennas, umbers	5%	½-1c.
Satin white	20%	½c.
Spirit varnishes, denatured	10%	25%
Spirit varnishes, not denatured	$1.32 per gal.+35%	$2.20 per gal.+25%
Vermilion reds	15%	25c.
Zinc oxides	10%	1½c.
Zinc oxides, in oil	15%	2½c.
Lithopone	15%	1½c.
Potassium chromate	1c.	2½c.
Potassium dichromate	1c.	2½c.
Potassium chlorate	½c.	1½c.
Potassium ferricyanide	2c.	7c.
Potassium ferrocyanide	1½c.	4c.
Potassium iodide	15c.	25c.
Potassium bicarbonate	½c.	1½c.
Potassium bromide	15% n.s.p.f.	10c.
Potassium carbonate	Free	½c.
Potassium hydroxide	Free	1c.
Potassium nitrate	0.35c.	½c.
Potassium permanganate	1c.	4c.
Santonin	Free	75c.
Soap, castile	10%	15%
Soap, toilet	30%	30%
Soap, all other	5%	15%
Sodium arsenate	Free	1c.
Sodium bicarbonate	½c.	½c.
Sodium borate	½c.	½c.
Sodium bromide	15% n.s.p.f.	10c.
Sodium carbonates	Free or ½c.	½c.
Sodium chlorate	½c.	1½c.
Sodium chloride, bags	Free	0.11c.
Sodium chloride, bulk	Free	0.7c.
Sodium chromate	½c.	1½c.
Sodium dichromate	½c.	1½c.
Sodium formate	15% n.s.p.f.	2c.
Sodium ferrocyanide	½c.	2c.
Sodium hydroxide	½c.	½c.
Sodium nitrite	½c.	3c.
Sodium phosphate	½c.	½c.
Sodium sulphate, crystals	Free	0.05c.
Sodium sulphate, anhydrous	Free	0.1c.
Sodium sulphide	½c.	½-½c.†
Sodium silicate	Free	½c.
Sodium sulphites	½c.	½c.
Sodium hydrosulphite	15% n.s.p.f.	35%
Sulphoxylates	15% n.s.p.f.	35%
Starch, potato	1c.	1½c.
Starch, all other	½c.	1c.

Commodity	Underwood Simmons Act of 1913	Fordney-McCumber Act of 1922
Dextrine, potato	1½c.	2½c.
Dextrine, all other	½c.	1½c.
Strontium salts	15% n.s.p.f.	25%
Strychnine	Free	15c. per oz.
Thorium nitrate	25%	35%
Tin compounds	10%	25%
Titanium compounds	15% n.s.p.f.	30%
Vanilla beans	30c.	30c.
Tonka beans	25c.	25c.
Zinc chloride	½c.	1⅛c.
Zinc sulphate	½c.	½c.
Zinc sulphide	15%	1½c.
CHEMICALS ON THE FREE LIST		
Arsenious acid or white arsenic	Free	Free
Arsenic sulphide	Free	Free
Chromic acid	Free	Free
Hydrofluoric acid	Free	Free
Hydrochloric acid	Free	Free
Nitric acid	Free	Free
Sulphuric acid	Free	Free
Cinchona bark	Free	Free
Albumen	3c.	Free
Calcium acetate	Free	Free‡
Calcium chloride	Free	Free
Calcium nitrate	Free	Free
Calcium cyanamide	Free	Free
Coal-tar products including crude anthracene, acenaphthene, benzene, carbazole, naphthalene, coal tar, etc.	Free	Free
Copper sulphate	Free	Free
Copper acetate	Free	Free
Crude drugs	Free	Free
Dyeing and tanning woods	Free	Free
Enfluerage grease	20%	Free
Floral essences	20%	Free
Ferrous sulphate	Free	Free
Gum damar, kauri, copal, tragacanth, tragasol, etc.	Free	Free
Iodine, crude	Free	Free
Monazite sand	25%	Free
Oil bearing seeds and nuts	Free	Free
Oils, essential	20%	Free
Potassium cyanide	Free	Free
Sodium cyanide	Free	Free
Potassium chloride, crude	Free	Free
Potassium sulphate, crude	Free	Free
Potash salts, crude, n.s.p.f.	Free	Free
Quinine	Free	Free
Radium salts	Free	Free
Sodium nitrate	Free	Free
Sodium sulphate, crude	Free	Free
Sulphur	Free	Free
Pyrites	Free	Free
Tapioca or cassava	Free	Free
Turpentine and rosin	Free	Free
Uranium salts	Free	Free
Waxes	Free	Free

* Not specially provided for.

† Depending on strength o grade.

‡ After 2 years the ad-valorem rates on intermediates and dyes will be reduced respectively to 40 and 45 per cent. These duties are to be based on the American selling price of similar competitive articles of American manufacture. Lacking such an article the duty is based on the American selling price of the imported article.

§ Provided the country of origin assesses no duty on calcium acetate when imported from the United States.

with those in the Underwood-Simmons act of Oct. 3, 1913.

Of most general interest are the rates on dyes and other coal-tar products. The Ways and Means Committee, the Senate Finance Committee and the joint conference each had the experience of inserting provisions for the extension of the recent embargo system—and each in turn saw it rejected. After the House had returned the bill to the conferees with instructions that they eliminate the dye embargo and place potash on the free list, it was evident that a higher tariff was the only acceptable compromise. Accordingly in the new law the coal-tar products known as intermediates and used in the manufacture of such finished articles as dyes, medicinals and photographic chemicals are made dutiable at 1c. per lb. and 55 per cent ad valorem based on the American selling price of any similar competitive product made in the United States. These rates, however, are to apply for only 2 years, after which time they are to be reduced to 40 per cent ad valorem and 7c. per lb. The finished coal-tar products—dyes, stains, color lakes, medicinals, aromatic chemicals, flavors, synthetic tanning materials, synthetic resins and explosives—are to be dutiable at 60 per cent ad valorem and 7c. per lb. for 2 years and thereafter the ad valorem rate is reduced to 55 per cent.

If there is no "similar competitive article" manufactured in the United States, then the ad valorem rate is to be based on the foreign value of the product plus certain specified additions for packing, shipping, etc. The terms "similar" and "competitive" are defined as follows:

> Any coal-tar product provided for in this act shall be considered similar to or competitive with any imported coal-tar product which accomplishes results substantially equal to those accomplished by the domestic product when used in substantially the same manner.

Many Synthetic Organic Chemicals Are Unprotected

Except for those of coal-tar origin and a few others mentioned specifically in the different paragraphs, synthetic organic chemicals are not specifically provided for and must therefore be included in the basket clause of paragraph 5 at a rate of 25 per cent ad valorem. This is a tremendous reduction in duty, for under the Bursum amendment to the Senate bill all synthetic organic chemicals, whether of coal-tar origin or not, were to receive the high compound duties based on American valuation. The compounds which suffer most by this omission are the organic medicinals such as barbital, certain of the acetylene, ethylene, propylene and other hydrocarbon derivatives, and many of the highly purified chemicals developed for research and experimental purposes.

Dye Duties Based on Strength

There are two important administrative features of the dye schedules which have appeared in all of the varied drafts of the bill but which have not received the attention they deserve. The first provides that the specific duties on dyes shall be based on standards of strength to be established by the Secretary of the Treasury and on all im-

portations which exceed these standards the duty shall be computed on the weight the article would have if it were diluted to standard strength. This will make it necessary for the Treasury Department to sample and report on all dye imports, but it will have the beneficial effect of preventing evasion of duties through the importation of highly concentrated dyes and their subsequent dilution in this country. Incidentally the standards of strength are to conform as nearly as practicable with those in ordinary commercial usage in this country prior to July 1, 1914.

The second provision is that beginning March 21, 1923, every package of imported dyes must be labeled with a "plain, conspicuous and truly descriptive statement" of the identity and percentage of actual dye contained therein. Furthermore, this label must not bear any fraudulent or misleading statement regarding the origin of the dye. This application of the principles of the pure food and drugs act to dyestuffs is an innovation that should eventually result in a marked improvement in the marketing of both imported and foreign dyes.

Other Changes in the Chemical Schedules

Potash as a result of the final mêlée in the conference was relegated to the free list—that is, as far as the crude salts are concerned. The refined compounds of potassium, with the exception of KCN, carry specific duties ranging between one-half cent on the nitrate and 25c. per lb. on the iodide.

Ammonium sulphate, originally introduced in the House bill with a duty of two-fifths of a cent per lb., emerged from the conference with the ¼c. rate imposed by the Senate.

Citric acid, always a source of controversy in tariff debates, was finally made dutiable at 17c. per lb. after the duty on its raw material, citrate of lime, had been boosted to 7c. per lb.

The rates on the higher strengths of lactic acid were increased to 4c. per lb. for the 30-55 per cent grades and 9c. per lb. for all strengths above 55 per cent.

The Underwood rate on fusel oil was ¼c. per lb. The House bill raised this to 6c., which was subsequently lowered to 2c. by the Senate, but the conferees saw fit to return to the House rate of 6c. per lb.

Casein had been on the free list for many years when the emergency tariff separated it out for a protective duty. In the new law it continues to be dutiable at a rate of 2½c. per lb. The plastic compounds of casein known as galalith are mentioned for the first time in this tariff act.

A feature of the vegetable oil paragraph is that all of the rates, with the single exception of rapeseed oil, are based on weight rather than measure. In the case of many of the oils which are imported in large quantities it has always been a difficult matter for the customs officials to assess duties based on gallonage when the products are bought and sold on a pound or ton basis.

I.C.C. Modifies Rail Priorities

In a service order effective Sept. 20, the Interstate Commerce Commission has modified its rules regarding preferential shipments eastward from the Mississippi River. Medicines, fertilizers, seeds, newsprint paper, mine supplies and petroleum have been added to the list of commodities entitled to priority movement.

It is understood that the new order was issued because of the complaint that various commodities had not been handled currently and promptly because of the different embargoes issued by the railroads during the coal and rail strikes.

The New York Market

New York, Sept. 24, 1922.

The enactment of the new tariff bill has already had some influence on the prices of chemicals and allied products. Advances have been quite common, especially among items frequently imported. The market, in general, may be said to be decidedly stronger than at any other time this year, and while business has not been materially increased, the consuming element has shown some inclination to emerge from its former status of extreme conservatism. The feature of the past week's activities has been the advance in acetate of lime quotations. This has been the third increase during the past few months and it is understood that prices on all acetate products will automatically be higher. Crude fusel oil and tartaric acid manufacturers have advanced quotations. Acetate of soda, sal ammoniac, barium chloride and carbonate, caustic potash, permanganate of potash, prussiates of potash and soda have all shown more activity at higher figures during the interval. Imported citric acid is soaring under the impetus of the 17c. per lb. duty provided by the new tariff.

General and Special Chemicals

Acetate of Lime—Increased production costs have been directly responsible for the recent advance in this commodity. Supplies are very firm among producers at $2.75 per 100 lb. Demand is fairly active.

Acetate of Soda—Spot and immediate shipment material is in very light supply and sellers have advanced quotations to 7½c. per lb. Buyers are showing considerable interest in the position of available supplies.

Barium Chloride—Large dealers were quite firm around $97 per ton for spot supplies. The general tone of the market is much firmer and the consuming demand has been moderately active.

Caustic Potash—The demand for this item has shown an appreciable increase and prices have been materially advanced. During the late trading 6½c. per lb. for 88-92 per cent goods was considered an inside figure for spot material.

Chlorate of Potash—Domestic factors were quoting 8½c. per lb. f.o.b. works.

Citric Acid—Imported material has been advanced to 48½c. per lb. on spot. Domestic producers are withholding quotations in an effort to prevent second-hand speculation. The shipment market is a nominal affair.

Nitrite of Soda—Prices have been firmly maintained at the recent advance and 9½c. per lb. was about the lowest figure heard on actual transactions. Offerings were rather light on spot.

Prussiate of Potash—Yellow material was quoted as high as 37c. per lb., although on some odd lots a shade lower might have been done on firm business. The red variety held at 95c. per lb. Demand has been quite active of late.

Prussiate of Soda—Leading dealers quoted the spot market around 24@24½c. per lb. The general tone of this market is much firmer than recently reported, due to the added costs of importations.

Sal Ammoniac—Sales of imported white granular were reported at 6½c. per lb. Some sellers were asking from 6¾@7c. per lb. The demand has shown a noticeable increase and sellers have shown no anxiety to offer any large quantities.

Tartaric Acid—Producers have advanced prices of the U.S.P. to 32c. per lb. on all varieties. Imported crystals were quoted at 31c. per lb., with the powdered at 31¼@31½c. per lb.

Coal-Tar Products

The market, in general, has been much healthier during the past week and producers are all of the opinion that the last quarter will bring considerable activity on items that have been dormant during the earlier months of this year. There has been a pronounced scarcity, with very little relief in sight, in phenol, toluene and benzene.

The selective embargo on coal-tar products contained in the emergency tariff law came to an end on Sept. 21, 1922, with the enactment of the new tariff law. It would appear quite probable that imports of certain crudes now on the free list may again appear on the market shortly.

Aniline Oil—Large factors quote the market at 15c. per lb. and report several sales at this figure. The tone of the market is somewhat stronger.

Benzoic Acid—The market remained quite firm and producers report sales at 72@75c. per lb. for the U.S.P. material. Small lots seemed to feature the trading.

Beta Naphthol—The demand for the technical variety has not been very active and the tone was much easier. Producers quote 23c. per lb. for immediate shipment.

Cresylic Acid—Prices on this commodity were very firm and sellers found some difficulty to meet the increased demand. The 97-99 per cent is quoted around 56@58c. per gal. and the 95 per cent at 51@53c. per gal.

Phenol—Producers named 18@20c. per lb. for shipments. Spot supplies are very light and holders are asking 21@22c. per lb. for the U.S.P. prime white crystals. The general condition of the market is extremely firm.

The St. Louis Market

ST. LOUIS, Sept. 19, 1922.

Trading conditions in this market have been very good during the past 2 weeks and prices very firm. The demand for domestic goods is increasing steadily, as stocks of imported material are comparatively light.

ALKALIS

Apparently the alkali market has reached the period of "normalcy." For quite a while now there has been no change of note in prices, while the volume of business being done is at least normal. *Solid caustic soda* in 5- to 10-drum lots is holding firm at $3.90 per 100 lb. delivered buyer's door and *flake caustic*, on the same basis of quantity and delivery, is quoted at $4.25. *Soda ash* is also thriving on a brisk market, and while no advance in prices has been reported, volume of business is good. In 5- to 10-bag lots it is quoted at $2.20 per 100 lb., with the usual differential of 20c. for barrels. *Bicarbonate of soda* is moving in its usual channels and has retained the price of $2.25 in 5-bbl. lots. Carload quotations in this market are around $1.85 per 100 lb,. f.o.b. buyer's shipping point. *Sal soda* is the weak sister of the alkali group at this time and is really without a price. Prices range from $1.50@$1.75 per 100 lb. in 1- to 5-bbl. lots.

GENERAL AND SPECIAL CHEMICALS

Heavy mineral acids continue to move in a fair way with prices unchanged. With the government surplus stocks of *carbolic acid* practically depleted, the market is becoming very firm and the demand seemingly good. *Citric acid* is not moving so well. *Ammonia water*, 26 deg., is moving through regular channels and prices remain the same. *White arsenic, powdered*, is still in heavy demand and supplies are light, with prices ruling about the same as our last report. There has been very little change in the *copperas* situation and the market is very firm. *Glycerine* has enjoyed another advance since our last report and is now quoted on a firm basis at 17½c. per lb. in drums. We expect to see our previous prediction of 18c. glycerine fulfilled in the near future. *Sulphur* has not changed since our last report and has, we think, reached bottom. While there has been no startling amount of sulphur business transacted recently, the market can scarcely be called stagnant.

VEGETABLE OILS AND NAVAL STORES

Castor oil is still holding firm at 14c., with no indication of a decline. It would not be at all surprising to see a further advance soon. *Turpentine* has advanced sharply again and today's quotation on single barrels is $1.40 per gal. and 5-bbl. lots at $1.34. *Linseed oil* has generally remained steady at the market price, with no changes and good volume of business transacted.

The Iron and Steel Market

PITTSBURGH, PA., Sept. 22, 1922.

Production of steel is now at between 60 and 65 per cent of capacity. The gain in the past week has been small relative to the gain which rather promptly followed settlement of the coal strike. Quickly a movement was re-established between mines owned by steel interests and their byproduct coke ovens and steel plants. Further increase would depend chiefly upon increased supplies of purchased coal or of coal or coke from the Connellsville region. The last weekly report of the Geological Survey expressed the opinion that the limit of coal production has been practically reached, having got up to the present transportation capacity of the railroads. Until conditions change, therefore, as for instance by the Lake coal shipping season ending or by the railroads becoming more efficient, little further increase in pig iron and steel production is to be expected, say beyond a 65 per cent operating rate.

CHANGES IN THE MARKET SITUATION

Market conditions, however, do not depict as great a scarcity of steel as appeared to exist a month ago. There have been some rather impressive changes in the market alignment. There is now very little demand for steel for late delivery, like December or the first quarter of the new year. Demand for early deliveries may be considered quite fair, for with the heavy buying that has marked the earlier portion of the year no very heavy tonnage of prompt steel should be expected as market demand at this time.

Since this is just the time of year when the steel market should stiffen if underlying conditions warrant a stiffening at all, the lightness of inquiry for forward delivery and the earlier deliveries obtainable at premium prices are significant. There seems to be a clear prospect that delivery premiums will disappear within the not distant future, perhaps in a month, leaving the whole market at the level now ruling for late delivery. For the greater part, this means simply the prices to which the Steel Corporation has lately adhered.

PROSPECTS FOR 1923

The common view is that there is a large volume of business to be done for 1923 delivery, industrial prospects being distinctly promising. Buyers and sellers of steel have never experienced difficulty in reaching a price basis when there was actual business to be done. With large business in prospect for 1923, a settling basis will no doubt be developed according to circumstances, either at present basis prices, ignoring delivery premiums now ruling, or at slightly lower prices. At the most, no great decline is to be expected. Present prices, for late delivery, average about $9 a ton above the market at its low point early in the year. Mills are unlikely to be willing again to go so near the cost line as at that time, while costs, on account of wage and fuel conditions, are up about $5 a ton.

According to delivery, price ranges in general are as follows: Bars, 1.90@2.25c.; shapes and plates, 2@2.25c.; sheets, 3.35@3.50c.; nails, $2.60@$2.75. Small lots of sheets seem to be bringing 3.75c. for very prompt shipment, but a good order for say 30 days' shipment could probably be placed at 3.50c. without difficulty.

Mills requiring box cars for shipping product have been short for some time, and a little steel has accumulated. Open top cars have now become scarce at some plants, resulting in slight accumulations of steel. Embargoes against shipment to one point or another are frequent and vexatious not simply to the consignee but also to the shipper.

PIG IRON MARKET

The pig iron market remains more or less stagnant. Only in an occasional instance has a merchant furnace been able to resume operations. A little Connellsville coke has been picked up, several brands having to be mixed, while the price is very high. In occasional instances furnaces are resuming on byproduct coke, but in general the increased supply of coal to byproduct ovens results simply in the operation of steel works furnaces.

Plainly pig iron prices are too high relative to the position of possible consumers, the result being a stagnant market, while attempts to buy large tonnages would merely send prices up. In basic iron there has been no defined market for some time, $30 valley being mentioned as a nominal quotation. It is doubted whether any steel works is in position to pay this price, while there are practically no offerings by merchant furnaces. There are some indications that steel works will offer basic iron in the market, on account of their steel orders not being able to absorb all their possible pig iron production. Bessemer remains quotable at $34 valley, and foundry on the basis of say $35 or $36 valley.

COKE AND COAL

Connellsville coke has stiffened in the week, being quotable now at $11@$12 for furnace and $13@$13.50 for foundry.

The Pittsburgh district coal market is a trifle easier. Indifferent grades of steam coal go at $4@$4.50, high-grade steam and gas coal being $4.50@$5. Good grades of domestic 1¼-in. lump stand at $5.25, this being the regular price of the Pittsburgh Coal Co.

STEEL SCRAP

Heavy melting steel scrap has undergone a sharp advance, having sold at $21.50, delivered in the Pittsburgh district, while it is thought that some Youngstown consumers have paid $22.50. Of late the Youngstown market has averaged nearly if not quite $1 above the Pittsburgh market. Demand is developing for cast scrap in charging box sizes. As high as $23.50 has been paid by foundries for cupola cast, and if steel works buy in such tonnages as would be natural the foundries will be confronted with higher prices still.

General Chemicals

Current Wholesale Prices in New York Market

		Carlots F.o.b. N.Y.	Less Carlots F.o.b. N.Y.
Acetic anhydride	lb.	..... –	$0.38 – $0.40
Acetone	lb.	$0 13½– $0 13¾	.14 – .14½
Acid, acetic, 28 per cent	100 lbs.	2 70 – 2 80	2 85 – 3 30
Acetic, 56 per cent	100 lbs.	5 35 – 5 40	5 45 – 5 75
Acetic, glacial, 99½ per cent, carboys, 100	lbs.	11 00 – 11 25	11 50 – 12 00
Boric, crystals	lb.	.11 – .11½	.11½– .12
Boric, powder	lb.	.11 – .11½	.11½– .12½
Citric	lb.	..... –	.48½– .49
Hydrochloric	100 lb.	1.10 – 1.20	1.25 – 1.70
Hydrofluoric, 52 per cent	lb.	.11 – .11½	.11 – .12
Lactic, 44 per cent tech	lb.	.09½– .10	.10½– .12
Lactic, 22 per cent tech	lb.	.04 – .04½	.04½– .05
Molybdic, c.p.	lb.	3.00 – 3.25	3.30 – 3.75
Muriatic, 20 deg. (see hydrochloric)		..... –	..... – .....
Nitric, 40 deg.	lb.	.06 – .06½	.06½– .07
Nitric, 42 deg.	lb.	.06½– .06¾	.07 – .07½
Oxalic, crystals	lb.	.17½– .17¾	.17½– .18½
Phosphoric, 50 per cent solution	lb.	.07½– .08	.08½– .09
Picric	lb.	.20 – .22	.23 – .27
Pyrogallic, resublimed	lb.	..... –	1.65 – 1.75
Sulphuric, 60 deg., tank cars	ton	10 00 – 10 50	..... – .....
Sulphuric, 60 deg., drums	ton	12 00 – 14 00	..... – .....
Sulphuric, 66 deg., tank cars	ton	15 00 – 16 00	..... – .....
Sulphuric, 66 deg., drums	ton	19 00 – 20 00	20.50 – 21.00
Sulphuric, 66 deg., carboys	ton	..... –	..... – .....
Sulphuric, fuming, 20 per cent (oleum) tank cars	ton	19.00 – 20.00	..... – .....
Sulphuric, fuming, 20 per cent (oleum) drums	ton	22.00 – 22.50	23.00 – 24.00
Sulphuric, fuming, 20 per cent (oleum) carboys	ton	31.00 – 32.00	33.00 – 34.00
Tannic, U. S. P.	lb.	..... –	.60 – .75
Tannic (tech.)	lb.	.40 – .45	.46 – .50
Tartaric, imported crystals	lb.	..... –	.31 – .31½
Tartaric acid, imp rted, powdered	lb.	..... –	.31½– .31½
Tartaric acid, domestic	lb.	..... –	..... – .32
Tungstic, per lb. of WO	lb.	..... –	1.00 – 1.10
Alcohol, ethyl (Cologne spirit)	gal.	..... –	4.75 – 4.95
Alcohol, methyl (see methanol)		..... –	..... – .....
Alcohol, denatured, 188 proof No. 1	gal.	..... –	.34 – .35
Alcohol, denatured, 188 proof No. 5	gal.	..... –	.34 – .35
Alum, ammonia, lump	lb.	.03½– .03¾	.03½– .04
Alum, potash, lump	lb.	.03 – .03½	.03½– .04
Alum, chrome lump	lb.	.05 – .05½	.05½– .06
Aluminum sulphate, commercial	100 lb.	1.50 – 1.65	1.70 – 2.25
Aluminum sulphate, iron free	lb.	.02½– .02¾	.03 – .03½
Aqua ammonia, 26 deg., drums (750 lb.)	lb.	.06½– .07½	.07½– .08
Ammonia, anhydrous, cyl (100-150 lb.)	lb.	.30 – .30½	.30½– .31
Ammonium carbonate, powder	lb.	.08½– .08¾	.09 – .09½
Ammonium nitrate	lb.	.06 – .06½	.06½– .07½
Amylacetate tech	gal.	..... –	2.35 – 2.50
Arsenic, white, powdered	lb.	.08½– 09	.09½– .09½
Arsenic, red, powdered	lb.	.12 – .12½	.12½– .13
Barium carbonate	ton	70 00 – 71 00	71 50 – 73 00
Barium chloride	ton	97 00 –100 00	101.00 –105.00
Barium dioxide (peroxide)	lb.	.20 – .21	.21½– .22
Barium nitrate	lb.	.07½– .07¾	.08 – .08½
Barium sulphate (precip.) (blanc fixe)	lb.	.04 – .04½	.04½– .04¾
Blanc fixe, dry	lb.	.04 – .04½	..... – .....
Blanc fixe, pulp	ton	45 00 – 55 00	..... – .....
Bleaching powder	100 lb.	2.00 – 2.10	2.15 – 3.25
Blue vitriol (see copper sulphate)		..... –	..... – .....
Bornx	lb.	.05½– .05¾	.06 – .06½
Brimstone (see sulphur, roll)		..... –	..... – .....
Bromine	lb.	.27 – .28	.28½– .35
Calcium acetate	100 lbs.	2.35 – 2.40	2.45 – 2.50
Calcium carbide	lb.	.04½– .04¾	.05 – .05½
Calcium chloride, fused, lump	ton	22 00 – 23 00	23 50 – 27 00
Calcium chloride, granulated	lb.	.01½– .01¾	.02 – .02½
Calcium peroxide	lb.	..... –	1.40 – 1.50
Calcium phosphate, tribasic	lb.	..... –	.15 – .16
Camphor	lb.	..... –	.83 – .85
Carbon bisulphide	lb.	.06½– .07	.07½– .07½
Carbon tetrachloride, drums	lb.	.09½– .10	.10½– .12
Carbonyl chloride, (phosgene)	lb.	..... –	.60 – .75
Caustic potash (see potassium hydroxide)		..... –	..... – .....
Caustic soda (see sodium hydroxide)		..... –	..... – .....
Chalk, precip.—domestic, light	lb.	.04½– .04¾	..... – .....
Chalk, precip.—domestic, heavy	lb.	.03½– .03¾	..... – .....
Chalk, precip.—imported, light	lb.	.04½– .05	..... – .....
Chlorine, gas, liquid-cylinders (100 lb.)	lb.	.05 – .05½	.05½– .06
Chloroform	lb.	..... –	.25 – .32
Cobalt oxide	lb.	..... –	2.00 – 2.10
Copperas	ton	20 00 – 22.00	23.00 – 30 00
Copper carbonate, green precipitate	lb.	.20 – .20½	.20½– .21
Copper cyanide	lb.	..... –	.58 – .60
Copper sulphate, crystals	100 lb.	5.75 – 6 00	6.10 – 6.50
Cream of tartar	lb.	..... –	.23 – .25
Epsom salt (see magnesium sulphate)		..... –	..... – .....
Ethyl acetate com. 85%	gal.	..... –	.65 – .70
Ethyl acetate, pure (acetic ether, 98% to 100%)	gal.	..... –	.90 – .95
Formaldehyde, 40 per cent	lb.	.09½– .10	.10½– .10½
Fullers earth, f.o.b. mines	net ton	16 00 – 17 00	..... – .....
Fullers earth—imported powdered—net	ton	30 00 – 32.00	..... – .....
Fusel oil, ref.	gal.	..... –	2.75 – 2 90
Fusel oil, crude	gal.	..... –	1.65 – 1 85
Glauber's salt (see sodium sulphate)		..... –	..... – .....
Glycerine, c. p. drums extra	lb.	..... –	.17½– .17¾
Iodine, resublimed	lb.	..... –	4.40 – 4.50
Iron oxide, red	lb.	..... –	.12 – .18
Lead acetate, white crystals	lb.	..... –	.10½– .11½
Lead arsenate, powd	lb.	.13 – .13½	.13½– .14½
Lead nitrate	lb.	..... –	.15 – .20
Litharge	lb.	.07½– .08	.08½– .09
Magnesium carbonate, technical	lb.	.06 – .06½	.06½– .07½
Magnesium sulphate, U. S. P.	100 lb.	2.00 – 2.25	2.30 – 2.50
Magnesium sulphate, technical	100 lb.	..... –	1.00 – 1.80
Methanol, 95%	gal.	..... –	.57 – .58
Methanol, 97%	gal.	..... –	.59 – .60
Nickel salt, double	lb.	..... –	.11 – .11½
Nickel salt, single	lb.	..... –	.12 – .12
Phogene (see carbonyl chloride)		..... –	..... – .....
Phosphorus, red	lb.	..... –	.40 – .45
Phosphorus, yellow	lb.	..... –	.30 – .35½
Potassium bichromate	lb.	.10½– .10¾	.11 – .11
Potassium bromide, granular	lb.	..... –	.17 – .23
Potassium carbonate, U. S. P.	lb.	.12 – .12½	.13 – .16
Potassium carbonate, 80–85%	lb.	.05 – .05½	.05½– .06
Potassium chlorate, powdered and crystals	lb.	.07½– .07¾	.08 – .08½
Potassium cyanide	lb	..... –	.55 – .57
Potassium hydroxide (caustic potash)	100 lb.	6.50 – 6.60	6.65 – 7.00
Potassium iodide	lb.	..... –	3.45 – 3.55
Potassium nitrate	lb.	.06½– .06¾	.07 – .08
Potassium permanganate	lb.	.16 – .16½	.16½– .17
Potassium prussiate, red	lb.	..... –	.95 – 1.00
Potassium prussiate, yellow	lb.	.37 – .37½	.37½– .38
Rochelle salts (see sodium potas. tartrate)		..... –	..... – .....
Salammoniac, white, granular	lb.	.06½– .07	.07½– .07½
Salammoniac, gray, granular	lb.	.07½– .08	.08½– .08½
Salsoda	100 lb.	1.20 – 1.40	1.45 – 1.60
Salt cake (bulk)	ton	25.00 –27.00	..... – .....
Soda ash, light, 58 per cent flat, bags, contract	100 lb.	1.60 – 1.67	2.00 – 2.25
Soda ash, light, 58 per cent flat, bags, resale	100 lb.	1.75 – 1.80	1.85 – 2.35
Soda ash, dense, in bags, resale	100 lb.	1.85 – 1.90	1.95 – 2.40
Sodium acetate	lb.	.07½– .07¾	.08 – .08½
Sodium bicarbonate	100 lb.	1.75 – 1.85	1.90 – 2.30
Sodium bichromate	lb.	.07½– .07¾	.08 – .08½
Sodium bisulphate (nitre cake)	ton	4.50 – 4.60	4.65 – 5.50
Sodium bisulphite powdered, U.S.P.	lb.	.04½– .04½	.04½– .05½
Sodium chlorate	lb.	.06½– .06¾	.07 – .07½
Sodium chloride	long ton	12 00 –13 00	..... – .....
Sodium cyanide	lb.	.19½– .21	.21½– .25
Sodium fluoride	lb.	.09 – .09½	.09½– .10
Sodium hydroxide (caustic soda) solid, 76 per cent flat, drums, contract	100 lb.	3.35 – 3.40	3.75 – 4.00
Sodium hydroxide (caustic soda) solid, 76% flat, drums, resale	100 lb.	3.60 – 3.65	3.70 – 4.00
Sodium hydroxide (caustic soda), ground and flake, contracts	100 lb.	3.80 – 3.90	4.25 – 4.40
Sodium hydroxide (caustic soda) ground and flake, resale	100 lb.	4.00 – 4.15	4.40 – 4.60
Sodium hyposulphite	lb.	.02½– .03	.03½– .03½
Sodium nitrite	lb.	.09½– .09¾	.09½– .10
Sodium peroxide, powdered	lb.	.28 – .30	.31 – .35
Sodium phosphate, dibasic	lb.	.03½– .04	.04½– .04½
Sodium potassium tartrate (Rochelle salts)	lb.	..... –	.18 – .21
Sodium prussiate, yellow	lb.	.24 – .24½	.24½– .24½
Sodium silicate, (40 deg. in drums)	100 lb.	.80 – 1.00	1.05 – 1.25
Sodium silicate, (60 deg. in drums)	100 lb.	2.25 – 2.40	2.45 – 2.75
Sodium sulphate, crystals (glaubers salt)	100 lbs.	.85 – .95	1.00 – 1.40
Sodium sulphide, f sed, 60-62 per cent (cone.)	lb.	.04½– .04¾	.04½– .05
Sodium sulphite, crystals	lb.	.03¼– .03¾	.03½– .04½
Strontium nitrate, powdered	lb.	.09½– .10	.10½– .12
Sulphur chloride, yellow	lb.	.04½– .05	.05½– .06
Sulphur, crude	ton	18 00 –20.00	..... – .....
Sulphur dioxide, liquid, cylinders extra	lb.	.08 – .08½	.09 – .10
Sulphur (sublimed), flour	100 lb.	..... –	2.25 – 3.10
Sulphur, roll (brimstone)	100 lb.	2.00 – 2.15	2.20 – 2.70
Talc—imported	ton	30 00 –40 00	..... – .....
Talc—domestic powdered	ton	18 00 –25.00	..... – .....
Tin bichloride	lb.	.10 – .10½	.10½– .10½
Tin oxide	lb.	..... –	.39 – .40
Zinc carbonate	lb.	.14 – .14½	.14½– .15½
Zinc chloride, gran.	lb.	.06 – .06½	.06½– .07
Zinc cyanide	lb.	.42 – .44	.45 – .47
Zinc oxide, XX	lb.	.07½– .08	.08½– 08½
Zinc sulphate	100 lb.	2.75 – 3.00	3.05 – 3.30

Coal-Tar Products

NOTE—These prices are for original packages in large quantities f.o.b. N.Y.:

Alpha-naphthol, crude	lb.	$0.95 — $1.00
Alpha naphthol, refined	lb.	1.10 — 1.15
Alpha-naphthylamine	lb.	.28 — .30
Aniline oil, drums extra	lb.	.15 — .17
Aniline salts	lb.	.20 — .22
Anthracene, 80% in drums (100 lb.)	lb.	.75 — 1.00
Benzaldehyde U.S.P.	lb.	1.35 — 1.50
Benzene, pure, water-white, in drums (100 gal.)	gal.	.30 — .35
Benzene, 90%, in drums (100 gal.)	gal.	.28 — .32
Benzidine, base	lb.	.85 — .95
Benzidine sulphate	lb	.80 — .85
Benzoic acid, U.S.P.	lb.	.72 — .75
Benzoate of soda, U.S.P.	lb.	.57 — .65
Benzyl chloride, 95-97%, refined	lb.	.25 — .27
Benzyl chloride, tech.	lb.	.20 — .23
Beta-naphthol benzoate	lb.	3.75 — 4.00
Beta-naphthol, sublimed	lb.	.50 — .55
Beta-naphthol, tech	lb.	.23 — .25
Beta-naphthyla mine, sublimed	lb.	1.50 — 1.60
Carbazol	lb.	.75 — .90
Cresol, U. S. P., in drums (100 lb.)	lb.	.12 — .15
Ortho-cresol, in drums (100 lb.)	lb.	.16 — .18
Cresylic acid, 97–99%, straw color, in drums	gal.	.56 — .65
Cresylic acid, 95-97%, dark, in drums	gal.	.51 — .58
Dichlorbensene	lb.	.06 — .09
Diethylaniline	lb.	.55 — .60
Dimethylaniline	lb.	.32 — .34
Dinitrobensene	lb.	.20 — .22
Dinitroclorbensene	lb.	.21 — .22
Dinitronaphthalene	lb.	.30 — .32
Dinitrophenol	lb.	.32 — .34
Dinitrotoluene	lb.	.22 — .24
Dip oil, 25%, car lots, in drums	gal.	.24 — .26
Diphenylamine	lb.	.54 — .56
H-acid	lb.	.75 — .80
Meta-phenylenediamine	lb.	.90 — 1.00
Monochlorbensene	lb.	.10 — .11
Monoethylaniline	lb.	.95 — 1.10
Naphthalene crushed, in bbls.	lb.	.06 — .06½
Naphthalene, flake	lb.	.06½— .07
Naphthalene, balls	lb.	.07½— .08
Naphthionate of soda	lb.	.58 — .65
Naphthionic acid, crude	lb.	.65 — .70
Nitrobensene	lb.	.10 — .12
Nitro-naphthalene	lb.	.30 — .35

Nitro-toluene	lb.	$0.15 —	$0.10
N-W acid	lb.	1.15 —	1.30
Ortho-amidophenol	lb.	2.10 —	2.15
Ortho-dichlor-benzene	lb.	.17 —	.20
Ortho-nitro-phenol	lb.	.75 —	.77
Ortho-nitro-toluene	lb.	.10 —	.13
Ortho-toluidine	lb.	.12 —	.14
Para-amidophenol, base	lb.	1.20 —	1.25
Para-amidophenol, HCl	lb.	1.25 —	1.30
Para-dichlorbenzene	lb.	.17 —	.20
Paranitroaniline	lb.	.72 —	.80
Para-nitrotoluene	lb.	.55 —	.65
Para-phenylenediamine	lb.	1.55 —	1.60
Para-toluidine	lb.	.85 —	.90
Phthalic anhydride	lb.	.35 —	.38
Phenol, U. S. P., drums	lb.	.21 —	.22
Pyridine	gal.	1.75 —	2.75
Resorcinol, technical	lb.	1.50 —	1.55
Resorcinol, pure	lb.	2.00 —	2.10
R-salt	lb.	.55 —	.60
Salicylic acid, tech., in bbls	lb.	.25 —	.27
Salicylic acid, U. S. P	lb.	.29 —	.30
Solvent naphtha, water-white, in drums, 100 gal	gal.	.27 —	.32
Solvent naphtha, crude, heavy, in drums, 100 gal	gal.	.12 —	.14
Sulphanilic acid, crude	lb.	.24 —	.26
Tolidine	lb.	1.20 —	1.30
Toluidine, mixed	lb.	.30 —	.35
Toluene, in tank cars	gal.	.25 —	.28
Toluene, in drums	gal.	.30 —	.35
Xylidines, drums, 100 gal	lb.	.40 —	.45
Xylene, pure, in drums	gal.	.40 —	.45
Xylene, pure, in tank cars	gal.	.45 —	....
Xylene, commercial, in drums, 100 gal	gal.	.33 —	.35
Xylene, commercial, in tank cars	gal.	.30 —	....

Waxes

Candellila, wax	lb.	.43 —	.45

Other Prices Remain Quotably Unchanged

Naval Stores

All prices are f.o.b. New York unless otherwise stated, and are based on carload lots. The oils in 50-gal. bbls., gross weight, 500 lb.

Rosin B-D, bbl	280 lb.	$6.50 —	$6.65
Rosin E-I	280 lb.	6.65 —	6.70
Rosin K-N	280 lb.	6.70 —	6.85
Rosin W. G.-W. W	280 lb.	7.85 —	8.40
Wood rosin, bbl	280 lb.	6.25 —	....
Spirits of turpentine	gal.	1.32 —	1.33
Wood turpentine, steam dist	gal.	1.15 —	....
Wood turpentine, dest. dist	gal.	1.12 —	.70
Pine tar pitch, bbl	200 lb.	..... —	6.00
Tar, kiln burned, bbl. (500 lb.)	bbl.	..... —	9.50
Retort tar, bbl	500 lb.	—	9.00
Rosin oil, first run	gal.	.38 —	.....
Rosin oil, second run	gal.	.41 —	.....
Rosin oil, third run	gal.	.48 —	.....
Pine oil, steam dist., sp.gr., 0.930-0.940	gal.		1.00
Pine oil, pure, dest. dist	gal.		.95
Pine tar oil, ref., sp.gr. 1.025-1.035	gal.		.46
Pine tar oil, crude, sp.gr. 1.025-1.035 tank cars f.o.b. Jacksonville, Fla	gal.		.35
Pine tar oil, double ref., sp.gr. 0.965-0.990	gal.		.75
Pine tar, ref., thin, sp.gr., 1.080-1.960	gal.		.25
Hardwood oil, f.o.b. Mich., sp.gr., 0.960-0.990	gal.		.25
Pinewood creosote, ref	gal.		.52

Fertilizers

Ammonium sulphate, f.a.s., N. Y., double bags	100 lb.	3.75 —	3.80
Blood, dried, f.o.b., N. Y	unit	4.60 —	....
Bone, 3 and 50, ground, raw	ton	42.00 —	44.00
Fish scrap, dom., dried, f.o.b. works	unit	3.10 —	3.20
Nitrate of soda	100 lb.	2.40 —	2.45
Tankage, high grade, f.o.b. Chicago	unit	4.50 —	4.60
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	3.50 —	4.00
Tennessee, 78-80%	ton	7.00 —	8.00
Potassium muriate, 80%	ton	33.00 —	34.00
Potassium sulphate	unit	1.00 —	.....

Crude Rubber

All Prices Same as Previous Report

Oils

VEGETABLE

The following prices are f.o.b. New York for carload lots.

Castor oil, No. 3, in bbls	lb.	$0.12½ —	$0.13
Castor oil, AA, in bbls	lb.	.13 —	.13½
China wood oil, in bbls	lb.	.12½ —	.12¾
Coconut oil, Ceylon grade, in bbls	lb.	.08½ —	.08¾
Coconut oil, Cochin grade, in bbls	lb.	.08¾ —	.09
Corn oil, crude, in bbls	lb.	.10 —	.10½
Cottonseed oil, crude (f. o. b. mill)	lb.	.06½ —	.07
Cottonseed oil, summer yellow	lb.	.09½ —	.09¾
Cottonseed oil, winter yellow	lb.	.10½ —	.10¾
Linseed oil, raw, car lots (domestic)	gal.	.88 —	.88½
Linseed oil, raw, tank cars (domestic)	gal.	.83 —	.84
Linseed oil, boiled, in 5-bbl lots (domestic)	gal.	.90 —	.91
Olive oil, denatured	gal.	1.15 —	1.17
Palm, Lagos	lb.	.06¾ —	.07
Palm, Niger	lb.	.06 —	.06½
Peanut oil, crude, tank cars (f.o.b. mill)	lb.	.08½ —	.08¾
Peanut oil, refined, in bbls	lb.	.12 —	.12½
Rapeseed oil, refined in bbls	gal.	.79 —	.80
Rapeseed oil, blown, in bbls	gal.	.86 —	.87
Soya bean oil (Manchurian), in bbls. N. Y.	lb.	.11½ —	....
Soya bean oil, tank cars, f.o.b., Pacific coast	lb.	.09¾ —	....

FISH

Light pressed menhaden	gal.	$0.53 —	....
Yellow bleached menhaden	gal.	.54 —	.55
White bleached menhaden	gal.	.56 —	.57
Blown menhaden	gal.	.61 —	....
Whale Oil, No. 1, crude, tanks, coast	gal.	.45 —	.48

Miscellaneous Materials

Prices remain quotably unchanged.

Ferro-Alloys

Ferrotitanium, 15-18%, f.o.b. Niagara Falls, N. Y	net ton	$200.00 —	$225.00
Ferrochromium, per lb. of Cr contained, 6-8% carbon, carlots	lb.	.10 —	10½
Ferrochromium, per lb. of Cr contained, 4-6% carbon, carlots	lb.	.10½ —	.11
Ferromanganese, 78-82% Mn, domestic	gross ton	69.00 —	72.00
Spiegeleisen, 19-21% Mn	gross ton	38.00 —	39.00
Ferromolybdenum, 50-60% Mo, per lb. of Mo	lb.	1.85 —	2.00
Ferrosilicon, 10-15%	gross ton	38.00 —	40.00
Ferrosilicon, 50%	gross ton	60.00 —	62.00
Ferrosilicon 75%	gross ton	115.00 —	120.00
Ferrotungsten, 70-80%, per lb. of contained W	lb.	.55 —	.70
Ferro-uranium, 35-50% of U, per lb. of U content	lb.	6.00 —	.....
Ferrovanadium, 30-40% per lb. of contained V	lb.	3.50 —	4.00

Ores and Semi-finished Products

All f.o.b. New York Unless Otherwise Stated

Bauxite, domestic, crushed and dried, f.o.b. shipping points	net ton	$6.00 —	$9.00
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 —	23.00
Chrome ore, 50% Cr_2O_3, f.o.b. Atlantic seaboard	ton	19.00 —	20.00
Coke, foundry, f.o.b. ovens	net ton	12.50 —	13.00
Coke, furnace, f.o.b. ovens	net ton	11.00 —	11.50
Fluorspar, gravel, f.o.b. mines, New Mexico	net ton	15.00 —	.....
Fluorspar, standard, domestic washed gravel Kentucky and Illinois mines	net ton	17.50 —	19.00
Ilmenite, 52% TiO_2, per lb. ore	lb.	.01½ —	.01¾
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.29 —	.....
Manganese ore, chemical (MnO_2)	net ton	60.00 —	65.00
Molybdenite, 85% MoS_2, per lb. of MoS_2, N. Y	lb.	.50 —	.55
Monazite, per unit of ThO_2, c.i.f., Atlantic seaport	unit	27.00 —	.....
Pyrites, Spanish, fines, c.i.f., Atlantic seaport	unit	.10½ —	.11
Pyrites, Spanish, furnace size, c.i.f. Atlantic seaport	unit	.12 —	.13½
Pyrites, domestic, fines, f.o.b. mines, Ga	unit	Nominal	
Rutile, 95% TiO_2 per lb. ore	lb.	.12 —	.....
Tungsten, scheelite, 60% WO_3 and over, per unit of WO_3 (nominal)	unit	6.25 —	6.50
Tungsten, wolframite, 60% WO_3 and over, per unit of WO_3, N. Y. C	unit	6.00 —	6.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	1.25 —	1.75
Uranium oxide, 96% per lb. contained U_3O_8	lb.	2.25 —	2.50
Vanadium pentoxide, 99%	lb.	12.00 —	14.00
Vanadium ore, per lb. of V_2O_5 contained	lb.	1.00 —	.....
Zircon, washed, iron free, f.o.b. Pablo, Florida	lb.	.04½ —	.13½

Non-Ferrous Metals

All f.o.b. New York Unless Otherwise Stated

	Cents per Lb.
Copper, electrolytic	14.00
Aluminum, 98 to 99 per cent	19.00–19.50
Antimony, wholesale lots, Chinese and Japanese	7.00–7.25
Nickel, ordinary (ingot)	36.00
Nickel, electrolytic	39.00
Nickel, electrolytic, resale	32.00–33.00
Nickel, ingot and shot, resale	30.00–31.00
Monel metal, shot and blocks	32.00
Monel metal, ingots	35.00
Monel metal, sheet bars	38.00
Tin, 5-ton lots, Straits	32.25
Lead, New York, spot	6.10–6.25
Lead, E. St. Louis, spot	5.90–6.00
Zinc, spot, New York	7.00–7.10
Zinc, spot, E. St. Louis	6.70–6.75

OTHER METALS

Silver (commercial)	oz.	$0.69¼
Cadmium	lb.	1.15
Bismuth (500 lb. lots)	lb.	2.20
Cobalt	lb.	3.00@3.25
Magnesium, ingots, 99 per cent	lb.	1.00@1.05
Platinum	oz.	$118.00
Iridium	oz.	2.75@3.00
Palladium	oz.	55.00
Mercury	75 lb.	67.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	11.00@11.25
Copper, heavy and wire	10.50@10.75
Copper, light and bottoms	8.50@8.75
Lead, heavy	4.50@4.75
Lead, tea	3.25@3.50
Brass, heavy	5.50@5.75
Brass, light	5.00@5.25
No. 1 yellow brass turnings	5.50@5.75
Zinc	2.25@2.50

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$2.90	$2.90
Soft steel bars	2.80	2.80
Soft steel bar shapes	2.80	2.80
Soft steel bands	3.40	3.40
Plates, ¼ to 1 in. thick	2.90	2.90

Industrial

Financial. Construction and Manufacturers' News

Construction and Operation

Alabama

DEMOPOLIS—The Gulf States Portland Cement Co. is planning for the erection of an addition to its plant at Spocari, Ala., to double, approximately, the present capacity of 1,200 bbl. per day. Plans will be prepared at an early date.

MONTGOMERY—The Excelsior Brick Co. is planning for the rebuilding of the portion of its plant, recently destroyed by fire with loss of about $35,000, including equipment.

Arkansas

GRAVETTE — The Spees Vinegar Co., Kansas City, Mo., is arranging a list of equipment for installation at its local plant, to include a hydraulic press, drying machinery and other primary apparatus. A new power house will be constructed at the mill.

Delaware

SOUTH WILMINGTON—The Wilmington Sugar Refining Co. is arranging for the early resumption of work on its new local refining plant, held in abeyance for a number of months past, and proposes to push the main works to completion. The plant will comprise a number of buildings, and is estimated to cost in excess of $750,000, including machinery. Armstrong & Latta, Land Title Bldg., Philadelphia, Pa., are engineers and contractors.

Florida

DADE CITY—M. F. Ackerman, Dade City, has preliminary plans under way for the organization of a company for the establishment and operation of a new plant for the manufacture of bricks and other burned clay products. A site for the proposed works has been selected.

Georgia

COLUMBUS — The Dixie Brick Co. has commenced the installation of new equipment at its plant for increased production in a number of departments. J. E. Minter is secretary and general manager.

COLUMBUS—James H. Palmer & Co., Inc., Columbus, Ga., has been incorporated with a capital of $10,000, to manufacture fertilizer products. The incorporators are A. Drane and James H. Palmer, Columbus. The last noted represents the company.

Indiana

HAMMOND—Fire, Sept. 7, destroyed a section of the local plant of the Inland Steel Co., with loss estimated at $50,000, including machinery. It is expected to rebuild at an early date.

INDIANAPOLIS—The Crown Chemical Co. has acquired the 4-story building at the northwest corner of Pennsylvania and Georgia Sts., known as the Hurst Bldg., 60x110 ft., and will occupy for a new plant. It was obtained for a consideration said to be $100,000. The company will remove its present works at 433-35 East South St., and will utilize the structures at the latter location as warehouses in the future. Arrangements have been made for a change of name to the Boncilla Laboratories. John M. Price is president and general manager; and J. S. Judy, vice-president and treasurer.

Louisiana

NEW ORLEANS—The Loyola University has plans in preparation for the erection of a new 4-story chemistry building, 60x200 ft., and plans to call for bids early in October. It is estimated to cost close to $250,000, including equipment.

NEW ORLEANS—The M. Augustin Paint & Glass Co. plans for the rebuilding of its plant at 612 Baronne St., recently destroyed by fire with loss estimated at close to $200,000.

NAPOLEONVILLE—The Godchaux Sugars, Inc., 527 Canal St., New Orleans, has tentative plans under consideration for the rebuilding of the portion of its local sugar-refining plant, known as the Elm Hall Refinery, destroyed by fire, Sept. 5, with loss estimated in excess of $1,500,000, including machinery, buildings and stock.

Maryland

BALTIMORE—The United States Industrial Chemical Co., Fairfield Rd., has filed plans for the erection of a 1-story works addition, 21x35 ft.

BALTIMORE — The Security Cement & Lime Co., Equitable Bldg., is perfecting plans for the proposed enlargement of its cement mill at Security, Md., to increase the capacity from 950,000 to 1,400,000 bbl. per year. Additional buildings will be erected and machinery installed. To provide for the expansion, the company has disposed of a note issue of $300,000. Loring A. Cover is president.

BALTIMORE—The Baltimore Water Paint Co. has acquired the factory property of the Crown Cork & Seal Co., on Eastern Ave., between 11th and 12th Sts., for a consideration said to be $25,000. The property consists of three buildings, which will be remodeled and improved for a plant for the new owner. It is planned to install additional equipment to cost, with building improvements, about $30,000. The new works are expected to be ready for service early in December.

Massachusetts

NATICK—The Griess-Pfleger Tanning Co., 179 South St., Boston, has completed plans for the erection of a new 1-story leather tannery, 180x320 ft., on local site, recently acquired on Washington St. Work will be inaugurated at an early date. Haven & Hopkins, 40 Court St., Boston, are engineers.

CAMBRIDGE—The Boston Woven Hose & Rubber Co., Hampshire St., has awarded a contract to William T. Reed, 201 Devonshire St., Boston, for the erection of a 1-story plant addition, 43x85 ft. The John O. DeWolf Co., 45 Bromfield St., Boston, is engineer.

Missouri

SPRINGFIELD—The Southwestern Tanning Co., 214 Holland Bldg., W. R. Wolfe, head, recently organized, has plans under way for the construction of a 1-story leather tanning pant, 100x135 ft., at 500 West Commercial St., estimated to cost about $16,000, exclusive of equipment. Earl Hawkins & Co., 400 McDanniel Bldg., are architects.

New Jersey

NEWARK—The Miner-Edgar Co., Blanchard St., manufacturer of chemical products, has filed plans for the erection of a new 2-story plant addition, 40x144 ft., estimated to cost approximately $40,000. Work will be placed in progress at once.

TRENTON—The Magnetic Pigment Co., 603-13 Cass St., has awarded a contract to the N. A. K. Bugbee Co., Trenton, for the erection of an addition to its plant for the manufacture of metallic pigments, estimated to cost approximately $50,000. It is planned to have the structure ready for equipment at an early date.

NEWARK—The American Tallow Co., Plum Point Lane, has filed plans for the construction of a 1-story plant addition, 35x60 ft.

HACKETTSTOWN—The Alphano Humus Co., manufacturer of fertilizer products, is reported to be planning for the rebuilding of the portion of its plant, destroyed by fire, Sept. 4, with loss estimated in excess of $50,000, including equipment and stock.

TRENTON—The Essex Rubber Co., Beakes and May Sts., manufacturer of general rubber specialties, has plans nearing completion and will soon take bids for the erection of a new 2-story addition. J. Osborne Hunt, 219 East Hanover St., is architect.

NEWARK—The Verona Chemical Co., 26 Verona Ave., is reported to be planning for the rebuilding of the portion of its plant, destroyed by fire recently with loss estimated in excess of $50,000.

CAMDEN—Fire, Sept. 9, destroyed a portion of the plant of the Keystone Leather Co., 17th and Carman Sts., with loss estimated at close to $50,000, including drying and other equipment. The two upper floors of a 4-story building were demolished.

New York

MINEOLA—George M. Murray, Garden City, L. I., has acquired property at the Merrick Rd. and the Long Island Railroad, for the erection of a new 1-story chemical works. Plans will be prepared at an early date.

North Carolina

WILMINGTON—The Southeastern Chemical Co., Charlotte, N. C., has acquired a local building for the establishment of a new branch plant for the manufacture of chemical specialties from pine byproducts. Machinery will be installed at an early date and operations inaugurated. Forrest A. Johnson heads the company.

Ohio

AKRON—The General Tire & Rubber Co. has preliminary plans in progress for enlargements in its plant to double, approximately, the present output of about 2,500 tires a day. It is proposed to have the extension equipped and ready for service by the first of the year.

ALLIANCE—The Crescent China Co., affiliated with the Sebring Pottery Co., Sebring, Ohio, has work under way on a new plant for the manufacture of fine chinaware, to comprise a main 1-story pottery and seven kilns. It is expected to have the plant ready for the equipment installation at an early date. The H. K. Ferguson Co., Euclid Ave., Cleveland, is architect and engineer. S. Morley is president and general manager.

Oklahoma

POTEAU — George F. Collins, Sapulpa, Okla., has acquired the local plant of the Hutton-Bates Glass Co., manufacturing bottles and other containers. The new owner will continue the operation of the plant and plans for a number of extensions and improvements, including the installation of additional equipment. Possession will be taken at once.

PONCA CITY — The Marland Refining Co. has plans in progress for extensions and improvements at its local oil refinery to increase the capacity from 6,000 to 14,000 bbl. of finished products per day. Additional machinery will be installed. It is also planned to construct an addition to the storage and distributing plant, including the installation of new steel tanks to bring the capacity to about 1,920,000 bbl. A new waterworks system will be installed to serve the plant property and vicinity. The expansion is estimated to cost close to $1,500,000.

PICHER — The Eagle-Picher Lead Co. is said to have plans under consideration for the rebuilding of the portion of its local works, destroyed by fire recently, with loss of about $25,000.

PAWHUSKA—The Chamber of Commerce is formulating plans for the establishment of a local plant for the manufacture of glass products. It is said that a company will be organized to operate the works.

Pennsylvania

BETHLEHEM—The Lehigh Valley Industrial Alcohol Co., recently organized under state laws, has plans under way for the erection of a new local plant for the manufacture of industrial alcohol, fusel oil, carbonic acid, potash and kindred specialties. The initial works will give employment to about 35 men. A site for the factory has been selected. Edward F. Reilly, Bethlehem, is treasurer; and Freeman H. Moyer, Allentown, vice-president.

CONSHOHOCKEN—The Ruth Glass Co. has work under way on the rebuilding of its mill, destroyed by fire a number of months ago. It is expected to resume operations at an early date.

READING—Samuel H. Bell, Reading, is selecting local property for the manufacture of inner tubes for automobile tire service and other rubber products. A similar plant now being operated in a neighboring locality will be removed to the new site, and the present equipment considerably increased.

PAXTONVILLE—The Paxton Brick Co. has tentative plans under consideration for the

rebuilding of the portion of its local plant, destroyed by fire, Sept. 11. Several kilns and buildings were demolished.

South Carolina

FLORENCE—The Florence Gas & Fuel Co., recently organized with a capital of $100,000, is planning for extensions and improvements in its local plant, lately acquired. New compressors, purifiers, boilers and other equipment will be installed, estimated to cost in excess of $30,000. M. D. Lucas is president.

South Dakota

RAPID CITY — The South Dakota State Cement Co., Pierre, S. D., has plans under way for the construction of a new plant at Rapid City, to include a number of mills, power plant and other operating buildings, estimated to cost close to $1,500,000, including machinery. J. C. Buckbee & Co., 38 South Dearborn St., Chicago, Ill., are engineers. A. C. Hunt is secretary and treasurer.

Tennessee

KNOXVILLE — W. J. Savage & Co., 912 West Clinch Ave., manufacturer of brick and other burned clay products, are planning for the erection of an addition to their plant, to cost about $25,000. Additional equipment will be installed.

KINGSPORT—The Mead Fiber Co., manufacturer of pulp soda and kindred products, has preliminary plans under way for the erection of a new local plant for the manufacture of fiber and paper products. The initial works will consist of three brick and steel mills, equipped for an output of about 35 tons per day. The plant is estimated to cost close to $1,000,000. J. H. Thickens is general manager.

Texas

HOUSTON—The Great Lakes Western Refining Co., operating the plant of the Port Houston Refining Co., recently acquired, has plans under way for the construction of a new oil refinery, with initial capacity of about 3,500 bbl. per day. It is planned to commence work at an early date.

EL PASO—The Dodson Cement Products Co., Dallas, has tentative plans under consideration for the erection of a new plant at El Paso, on site recently selected, estimated to cost about $65,000.

BURKBURNETT—The Revere Oil Co., Fort Worth, is said to be planning for extensions and improvements in the oil-refining plant at Burkburnett, recently acquired from the Burk-Tex Production Co. The present refinery has a capacity of about 4,000 bbl. per day, and this will be increased.

DALLAS—The Trinity Paper Mills Corporation, operating a small mill at Commerce, Tex., is perfecting plans for the erection of a new paper mill in the vicinity of Dallas, for the manufacture of fine papers, using cotton linters as raw material. The plant is estimated to cost close to $400,000, including machinery. The company is capitalized at $6,000,000. J. V. Webb is president, and A. H. Davidson, treasurer.

Virginia

LEXINGTON — The board of directors of the Washington & Lee University will take bids early in October for the erection of the proposed new chemistry building at the institution, estimated to cost about $150,000. Flournoy & Flournoy, 306 St. Paul St., Baltimore, Md., are architects.

WINCHESTER—The Snapp Foundry, Inc., recently organized with a capital of $50,000, will take over the local foundry heretofore operated under the name of the Snapp Co. The new company will specialize in the manufacture of a general line of castings, and contemplates plant improvements. C. Arthur Robinson is secretary.

West Virginia

PARKERSBURG—The General Porcelain Co. is completing plans and will soon commence the erection of a new 1-story plant addition, 65x225 ft., estimated to cost about $25,000. It will be equipped for general production.

Wyoming

CHEYENNE—The Mammoth Oil Co., recently organized under Delaware laws with a capital of $200,500,000, as a subsidiary of the Sinclair Consolidated Oil Corp., 45 Nassau St., New York, N. Y., will operate in the Teapot Dome Fields, lately acquired from the government under lease. The new properties will be improved with refineries, storage and distributing plants, and constitute a total of about 9,000 acres.

Industrial Developments

PAPER—The International Paper Co., New York, is maintaining full production at its different mills in New York and Canada, and new plants, recently completed, are giving employment to a full working force at close to capacity.

The Eastern Mfg. Co., Bangor, Me., is operating at capacity at its pulp and paper mills. During the past few weeks orders for paper have been in excess of production, and pulp shipments have been the largest in many months past. An oil-burning system is being installed to insure continuous operation.

The Spanish River Pulp & Paper Co. and the Lake Superior Paper Co., affiliated, Toronto, Canada, are operating at close to normal at their mills, with regular working force. It is expected to maintain the present basis of production for an indefinite period.

RUBBER—The Goodyear Tire & Rubber Co., Akron, O., is running at full capacity at its Canadian mills, under a 3-shift schedule, 8 hours each. It is said that present orders will require the maintaining of 24-hour plant operation for an indefinite period.

New production records were established by rubber factories at Akron, O., during August, and September operations are being continued on the same basis. The Firestone Tire & Rubber Co. is running on a basis of 26,000 tires a day; the Goodyear Tire & Rubber Co. is maufacturing 22,000 tires daily; the Goodrich Tire & Rubber Co., the Mason Tire & Rubber Co. and the Miller Rubber Co. are all running full.

Owing to the expected curtailment in Ford automobile production, the Goodyear Tire & Rubber Co., Akron, O., has reduced operations at its Plant No. 2, devoted to tire manufacture for such cars, to a 4-day week schedule. Heretofore the plant has been running three shifts per day on a 5½-day week.

GLASS — The Scott-Warner Glass Co., Stroudsburg, Pa., is completing the rebuilding of its local plant, destroyed by fire a number of months ago, and plans to place the factory in operation at an early date, giving employment to close to 100 men.

The Johnston Glass Co., Hartford City, Ind., is maintaining active production at its local plant, giving employment to a regular working force. The wage schedule has recently been advanced 25 per cent. The company specializes in window glass manufacture.

The Pittsburgh Glass Sand Co., Pittsburgh, Pa., is running full at its two plants at Mapleton, near Lewistown, Pa. A wage increase has been granted, effective Sept. 4, with common labor receiving $3.50 a day under the new schedule and corresponding increases in other departments. The Pennsylvania Glass Sand Co., operating in this same district, has also made similar wage increases at its plant.

The Owens Bottle Co., Toledo, O., has recently advanced production at its plant, following improvements made for this purpose. A large working force is being employed.

Glass plants at Pittsburgh, Kane and other points in western Pennsylvania are planning to advance production to a third shift working day, under full 24-hour operation before the close of the fall season, the increase being based on the volume of incoming orders.

OIL—The Pure Oil Co. has resumed operations at its refinery near Ardmore, Okla., following a shut-down of several months. It is expected to advance the output gradually to maximum, wken employment will be given to about 75 men.

The Mexican Petroleum Co., New York, N. Y., is increasing production at its Mexican plants. During August a total of 4,000,000 bbl. of oil was produced, as compared with 3,500,000 bbl. in the preceding month.

IRON AND STEEL—The Brier Hill Steel Co., Youngstown, O., has blown in another furnace at its plant, making the third unit now in blast.

The A. M. Byers Co., Girard, O., is planning for the early resumption of operations at its local blast furnace, which has been shut down for a number of weeks. The puddling mill has started up. About 1,200 men will be empoyed following the adoption of a full-capacity schedule.

The American Sheet & Tin Plate Co., a subsidiary of the United States Steel Corp., is arranging for the immediate resumption of eight hot mills at the local plant, following a month's shut-down due to fuel shortage.

The Eastern Rolling Mill Co., Baltimore, Md., specializing in the manufacture of steel sheets, is running at close to 100 per cent at its plant, giving employment to about 1,200 operatives, or approximately double the number at the works at the beginning of the year. The wages of common labor have been increased 20 per cent, or from 25 to 30 cents an hour, with 8-hour working day. It is said that orders on hand insure full capacity for many months to come.

The Republic Iron & Steel Co., Youngstown, O., has blown in another blast furnace at its mills, making the fourth unit on the active list. Other departments of the works are advancing production.

The Trumbull-Cliffs Iron Co., Youngstown, O., has blown in its blast furnace, following curtailment for a number of weeks due to coal and coke shortage.

The Youngstown Sheet & Tube Co., Youngstown, O., has lighted another blast furnace at its local plant and made additions in the working force. Further increases will be made at an early date.

MISCELLANEOUS — The New York & Pennsylvania Co., Johnsonburg, Pa., has resumed operations at its whiting plant and soda mill, following a suspension for about a month past on account of fuel shortage. Approximately 125 men are employed in the two mills.

The Standard Sanitary Mfg. Co., Tiffin, O., has been forced to curtail operations at its local pottery, due to a strike of about 100 men in protest against the employment of several non-union molders at the plant.

The Atlas Portland Cement Co., Northampton, Pa., is running full at its large mills in this district, and has recently announced a general wage increase affecting all employees. The Lehigh Portland Cement Co., Allentown and Coplay, Pa., has also advanced the wage schedule at its mills. Capacity output is being maintained at the latter plants.

The New Jersey Zinc Co., Palmerton, Pa., is giving employment to close to normal working force at its local plant, under full-time production. A general wage increase has recently been placed into effect.

The International Nickel Co., New York, has resumed operations at its plant at Coppercliff, Ont., following a suspension of 18 months. The initial production will be on a basis of about one-third of maximum output, giving employment to about 650 men under a two-shift operating schedule, 18 hours per day total. The company is also operating its refining plant at Port Colborne, and shipments are being made from the Creighton mines. All refined production is being sent to the new rolling mills at Huntington, W. Va.

New Companies

THE NATIONAL RUBBER CO., Los Angeles, Calif., has been incorporated with a capital of $100,000, to manufacture rubber products. The incorporators are E. J. Chambers and R. H. Watts, Long Beach, Calif., and Harry W. Mahan, Room 618, O. T. Johnson Bldg., Los Angeles. The last noted represents the company.

H. O. BOEHME, INC., New York, N. Y., care of P. C. Schnitzler, 35 Nassau St., representative, has been incorporated with a capital of $25,000, to manufacture metallic compounds and affiliated products. The incorporators are H. O. Boehme and K. Braun.

THE HOOSIER FERTILIZER CO., 1400 North Halsted St., Chicago, Ill., has been incorporated with a capital of $40,000, to manufacture fertilizer products. The incorporators are Maurice and Samuel L. Sarnatzky.

THE ARION STEEL CO., Boston, Mass., has been incorporated with a capital of 500 shares of stock, no par value, to manufacture steel products. Harry F. Arion, 83 Lawrence St., Medford, Mass., is president and treasurer.

THE ARROW CHEMICAL CO., Newark, N. J., has been incorporated with a capital of $100,000, to manufacture chemicals and chemical byproducts. The incorporators are Walter A. Beers, William A. and Edward A. Schilling, 763 Broad St. The last noted represents the company.

THE INDIANAPOLIS SOAP CO., Indianapolis, Ind., has been organized under state laws to manufacture soaps, washing powders, etc. The incorporators are Jesse M. and Sidney F. Daily, both of Indianapolis.

THE FALCONER PLATE GLASS CORP., Falconer, N. Y., care of Jackson, Manley & Herrick, attorneys, Jamestown, N. Y., representative, has been incorporated with a

capital of $150,000, to manufacture glass products. The incorporators are E. A. Peterson, B. H. Tefft and S. O. Merriman, Falconer.

THE M. E. FOLSOM FLOOR & WALL TILE Co., Union Hill, N. J., has been incorporated with a capital of $10,000, to manufacture and deal in ceramic floor and wall tile and affiliated products. The incorporators are M. E. Folsom, Frederick Brunning, Jr., and William Hinderks, 509 Gardner St., Union Hill. The last noted represents the company.

THE CALEDONIA OIL CORP., care of the Corporation Service Co., Equitable Bldg., Wilmington, Del., representative, has been incorporated under state laws with a capital of $500,000, to manufacture petroleum products.

THE SHERMAN OIL MILL, INC., Sherman, Tex., has been incorporated with a capital of $175,000, to manufacture petroleum products. The incorporators are J. H. Wharton, Thomas Forbes and N. A. Birge, all of Sherman.

THE DETROIT TYLITE CO., Detroit, Mich., has been incorporated with a capital of $50,000, to manufacture composition tile and kindred building products. The incorporators are J. H. McIntyre, W. F. Rue and Frederick S. Beard, 2460 Central Ave., Detroit. The last noted represents the company.

THE INDEMAND PRODUCTS CORP., care of the Colonial Charter Co., Ford Bldg., Wilmington, Del., representative, has been incorporated with a capital of $100,000, under state laws, to manufacture rubber products.

THE STAMFORD COTTON OIL CO., INC., Stamford, Tex., has been incorporated with a capital of $120,000, to manufacture cottonseed oil products. The incorporators are W. A. Bennett, L. W. and C. L. Jones, all of Stamford.

THE MILLIKEN BRICK CO., Pittsburgh, Pa., is being organized by Homer A. Milliken and John F. Baldwin, to manufacture brick and other burned clay products. Application for a state charter will be made on Oct. 2. The company is represented by R. A. McCrady, 1430 Park Bldg., Pittsburgh.

THE MEMPHIS COTTON HULL FIBRE CO., Memphis, Tenn., has been incorporated with a capital of $15,000, to manufacture fiber products. The incorporators are Walter Wolf, A. J. V. Ware and S. S. Dent, all of Memphis.

THE GLIDDEN OIL CO., care of the Corporation Service Co., Equitable Bldg., Wilmington, Del., representative, has been incorporated under state laws with a capital of $1,000,000, to manufacture petroleum products.

THE YONKERS SOAP MFG. CO., care of D. Dorfinkel, attorney, Yonkers, representative, has been incorporated with a capital of $5,000, to manufacture soaps, washing powders, etc. The incorporators are H. Lerner, N. and D. J. Ressler, all of Yonkers.

THE SOUTH BEND GLASS WORKS, INC., South Bend, Ind., has been incorporated with a capital of $25,000, to manufacture glass products. The incorporators are Frank Haynes, Clarence K. and Herman H. Beyrer, all of South Bend.

THE DURATEX CO., 768 Frelinghuysen Ave., Newark, N. J., has been incorporated under state laws with a capital of $1,900,000, to manufacture imitation leather products. The incorporators are the officials of the company of the same name, now operating a plant at the location noted.

THE MERCER REFINING CO., Franklin, Pa., has been incorporated with a capital of $75,000, to manufacture refined oil products. W. C. Hastings, Franklin, is treasurer and representative.

THE CHEMICAL SPECIALTY CO., 380 Main St., Pawtucket, R. I., has filed notice of organization to manufacture chemicals and chemical byproducts. Richard Rouse heads the company.

THE LOUIS HUETWOHL BRASS FOUNDRY, INC., Brooklyn, N. Y., care of I. Phillips, 303 West 122nd St., New York, representative, has been incorporated with a capital of $50,000, to manufacture brass, bronze and other metal castings. The incorporators are G. and L. Schimper, and Louis Huetwohl.

THE SIMPLEX PETROLEUM CO., Long Beach, Calif., has been incorporated with a capital of $200,000, to manufacture petroleum products. The incorporators are Albert Stephens, H. Earl Hardy, and Vern Dumas, 1155 Burnett St., Long Beach. The last noted represents the company.

THE BUSTER BROWN SOAP CO., Indianapolis, Ind., has been incorporated with a capital of $10,000, to manufacture soap products. The incorporators are Arthur B. Brown, A. L. Coburn and Gilbert McGaughey, all of Indianapolis.

THE BUTTERS MFG. CO., New York, N. Y., care of A. J. Lindsay, 43 Cedar St., representative, has been incorporated with a capital of $75,000, to manufacture chemicals and chemical byproducts. The incorporators are W. C. Findley and W. A. Levy.

THE ROONEY & ELY FERTILIZER CO., Jersey City, N. J., care of the Corporation Trust Co., 15 Exchange Place, Jersey City, representative, has been incorporated with a capital of $10,000, to manufacture fertilizer products. The incorporators are C. J. Skinner and W. J. Edelman.

THE JONES & LEIGH MFG. CO., New York, N. Y., care of L. I. Geber, 291 Broadway, representative, has been incorporated with a capital of $100,000, to manufacture paper products. The incorporators are G. L. Leigh, W. A. Simon and H. A. Jones.

THE MERION MAGNESIA CO., Port Kennedy, Pa., has been incorporated with a capital of $5,000, to manufacture magnesia products. Clayton Ullman, Phoenixville, Pa., is treasurer.

THE WALTER L. JOHNSON CO., Endicott, N. Y., has been incorporated with a capital of $12,500, to manufacture leather products. Walter L. Johnson, Endicott, heads the organization, and represents the company.

THE UNITED STATES PACKING & LUBRICATING CO., Philadelphia, Pa., care of the Capital Trust Co. of Delaware, Dover, Del., representative, has been incorporated under Delaware laws, with capital of $600,000, to manufacture lubricants and kindred products. The incorporators are Alfred E. George, D. J. Mullins, Philadelphia; and Francis J. MacDonald, Ardmore, Pa.

Manufacturers' Catalogs

THE SCHUTTE & KOERTING CO., Philadelphia, Pa., describes in bulletin 8-G the new Schutte regrinding swing gate valve, which is a straightway closing valve designed for steam pressures up to 300 lb. per sq.in. and temperatures up to 750 deg. F. The company announces that this valve offers no obstruction to the steam flow or change of direction, and that the outstanding feature is that the valve disk is readily accessible for regrinding purposes without dismounting the valve.

THE W. W. SLY MFG. CO., Cleveland, O., is issuing a bulletin, S-90, entitled "Dust—A Loss and a Gain." It contains new and interesting matter concerning the collection of industrial dust.

THE BRISTOL CO., Waterbury, Conn., has ready for distribution a 68-page catalog (No. 1401) devoted to Bristol's pyrometers. The catalog is profusely illustrated and contains very valuable condensed information on this subject.

THE B. F. STURTEVANT CO. of Hyde Park, Boston, Mass., has just issued a new 72-page engineering bulletin on Pneumatic Collecting and Conveying. It contains 33 pages of pictures and diagrams, 17 pages of useful tables—how to find the size of fans, the suction, volume, r.p.m. and horsepower for any system, cubic feet of air handled per minute, size of pipe and ducts used, and various other valuable tables. Data are also given on dust collecting from grinding and polishing machines, tumbling barrels, sand blast machines, coal breakers, shoe machinery and the removal of fumes, gases, etc. In addition, there are parts on the conveying of pulverized coal, fibrous materials, coffee, ashes, wool, wood chips, etc. It is a most comprehensive treatise on pneumatic collecting and conveying systems.

THE RAYMOND BROS. ENGINEERING CO., Chicago, Ill., calls attention to a new catalog on "Rayco Pulverized Coal Systems—Their Design, Installation and Operation." This attractive catalog, which is well illustrated, has chapters on engineering service, fuel economy, essentials to successful results, records of results and savings, growth in use of powdered coal, combustion efficiency, character of powdered coal flame, variety of applications, plan of typical plant, crushing equipment, drying equipment, pulverizing equipment, distributing equipment, burners, tables of capacities, detail parts, individual unit, installations and data sheets.

THE ELECTRIC FURNACE CO., Salem, O., has issued a folder illustrating some of the types of electric enameling, annealing and heat-treating furnaces it has installed in the last few years. Another folder, on the "Baily Electric Furnaces" tells what nonferrous alloys the company is melting, and what products it is producing.

Industrial Notes

THE NORWALK IRON WORKS CO. announces that it has merged with it the Automatic Carbonic Machine Co. of Peoria, Ill., the plant and equipment of which company is being moved to South Norwalk, Conn.

C. E. Reese, editor of the *Gas Engineering & Appliance Catalog* and associate editor of the *Gas Age-Record*, has joined the stoker sales department of the Westinghouse Electric & Mfg. Co., at South Philadelphia. He was previously cadet engineer and combustion engineer with Henry L. Doherty & Co. and assistant engineer of the Illinois Public Utilities Commission. Mr. Reese will work with G. A. Sacchi, manager of the stoker sales department and R. R. Davis, manager of the department of publicity at East Pittsburgh.

THE U. S. ELECTRO GALVANIZING CO. announces change of name to the U. S. Galvanizing & Plating Equipment Corp., with main office and factory at 32 Stockton St., Brooklyn, N. Y.

THE MERRIMAC CHEMICAL CO., Boston, Mass., announces the following appointments: Sales manager, William M. Rand; chief engineer, J. B. Rutter, and designing engineer, M. S. Maxim.

L. J. Krom has established an office at 50 Church St., New York City, for the purpose of carrying on a consulting, metallurgical and engineering practice which will be devoted to the production and consumption of metals and alloys.

Coming Meetings and Events

AMERICAN GAS ASSOCIATION will hold its annual convention and exhibition at Atlantic City, Oct. 23 to 28.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS is holding its 126th meeting at San Francisco, Calif., Sept. 25-29, 1922.

AMERICAN SOCIETY FOR STEEL TREATING will hold its International Steel Exposition and Convention in the General Motors Bldg., Detroit, Mich., Oct. 2 to 7.

AMERICAN WELDING SOCIETY will hold its fall meeting Oct. 2 to 5 at Chicago.

INTERNATIONAL CHAMBER OF COMMERCE will hold its second general meeting in Rome, Italy, March 19-26, 1923.

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING will be held at the Grand Central Palace Dec. 7-13, with the exception of the intervening Sunday.

NEW JERSEY CHEMICAL SOCIETY holds a meeting at Stetters Restaurant, 842 Broad St., Newark, N. J., the second Monday of every month.

SOCIETY OF INDUSTRIAL ENGINEERS will hold a 3-day national convention in New York, beginning Oct. 18. The general topic of the convention is "Economics of Industry."

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY will hold its fall meeting Oct. 9 and 10, at the Hotel Wolverine, Detroit, Mich.

The following meetings are scheduled to be held in Rumford Hall, Chemists' Club, 52 East 41st St., New York City: Oct. 6—American Chemical Society, regular meeting Oct. 13—Société de Chimie Industrielle, regular meeting. Oct. 20—Society of Chemical Industry, Grasselli Medal. Nov. 10—American Chemical Society (in charge), Society of Chemical Industry, American Electrochemical Society, Société de Chimie Industrielle, joint meeting. Nov. 17—American Electrochemical Society, regular meeting. Dec. 1—Society of Chemical Industry, regular meeting. Dec. 8—American Chemical Society, regular meeting. Jan. 5—American Chemical Society, regular meeting. Jan. 12—Society of Chemical Industry, Perkin Medal. Feb. 9—American Electrochemical Society (in charge), Society of Chemical Industry, Société de Chimie Industrielle, American Chemical Society, joint meeting. March 9—American Chemical Society, Nichols Medal. March 23—Society of Chemical Industry, regular meeting. April 20—Society of Chemical Industry (in charge), American Electrochemical Society, Société de Chimie Industrielle, American Chemical Society, joint meeting. May 4—American Chemical Society, regular meeting. May 11—Société de Chimie Industrielle (in charge), American Chemical Society, American Electrochemical Society, Society of Chemical Industry, joint meeting, May 18—Society of Chemical Industry, regular meeting. June 8—American Chemical Society, regular meeting.